ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Vol. 9. No. 25. WEEKLY. NEW YORK, SATURDAY, FEBRUARY 19, 1887. $3 per annum. Single Copies, 6 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Improved Electric Boat of Monsieur Trouve.

At a recent meeting of the International Society of Electricians, in Paris, M. Trouvé read a paper describing the latest development of his electric pleasure yacht. At the Paris Electrical Exhibition, in 1881, M. Trouvé showed a small pleasure boat propelled by electricity. Viewed in the light of the present day, when an electric launch has successfully crossed and re-crossed the Channel, the tiny craft exhibited six years ago was hardly more than a scientific plaything; but from small beginnings the inventor has gradually developed a really serviceable boat, in which electricity is not only used as the propelling power, but also to work a siren, a precaution which, on account of the increased speed, has become necessary. We are indebted to our esteemed Loudon contemporary, *Industries*, for the following particulars: The current is furnished by four of Trouvé's well-known batteries, each containing six cells, the E.M.F. of each being 1.9 volts, with a resistance of .07 to .08 ohm. This battery is practically the same as that employed by him now for some years; but considerable improvements have been made in the motor. As will be seen from Fig. 1, the field magnets are curved, so as to reduce their weight, and the armature is a Gramme ring, built up of soft iron disks of extreme thinness, about 120 to the inch. The interpolar space between armature and the pole pieces is very small, so as to produce an intense field, and the total weight of the half horse-power motor is stated to be only 18 lbs. The table gives results obtained with this motor and one of double the power:

EXPERIMENTS WITH TROUVÉ MOTORS, MADE BY D'ARSONVAL.

Size. H. P.	Weight. Lbs.	Diam. of Wire in Mils. Field.	Diam. of Wire in Mils. Armature.	Speed.	Current.	Pressure.	Watts. Supplied.	Watts. Developed.	Efficiency per cent.
×	18	80	47	3800	14	35	490	193	39
×	18	80	47	3400	18	34	612	259	42
×	18	80	47	3100	19	43	817	350	43
×	18	80	55	2900	17	38	544	197	34
×	18	80	40	2700	11	38	418	164	44
×	18	80	40	2300	16	46	736	307	42
×	18	80	40	2400	17	50	850	388	46
1	40	118	69	3100	14	55	770	490	63
1	40	118	59	3340	17	60	1020	650	64
1	40	118	59	3330	19	66	1254	778	62

Considering the small weight of this motor, the speed can by no means be called excessive, whilst the efficiency is fairly good. The motor is mounted on the rudder head, and transmits motion by a gut to a screw of peculiar construction. M. Trouvé has found, experimentally, that it is more economical to run a small screw at high speed, than a larger screw at lower speeds. The screw is made in the following manner: Helicoidal channels are cut in the nave on an ordinary screw cutting lathe, and thin metal bars are placed into the channels pointing radially outwards, the outer and inner ends being secured by soldering, and the surface made up with thin sheets. M. Trouvé claims that, with this screw and his electromotor, he has obtained a speed of nine miles per hour. The direction of movement is controlled by a switch with six terminals (shown in Fig. 1) by means of which the current through the armature can be reversed, without reversing the current through the field magnets. Since this craft is used for pleasure purposes, and in the natural course of things must often be in crowded waters, a siren, to signal its approach, is almost indispensable, especially since the electric propulsion is practically noiseless. This siren is shown in Fig. 2,

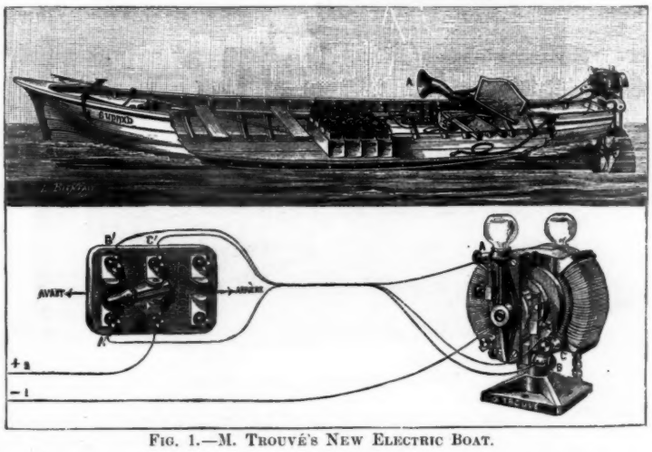


FIG. 1.—M. TROUVÉ'S NEW ELECTRIC BOAT.

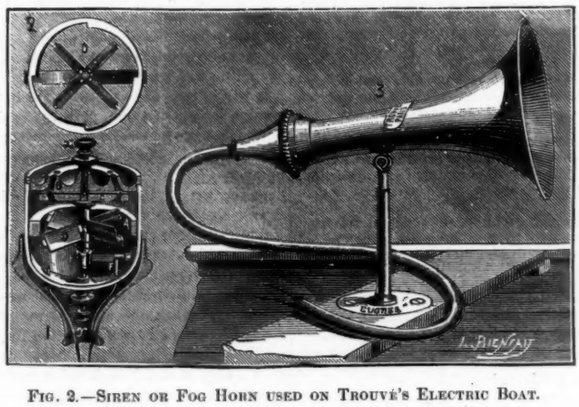


FIG. 2.—SIREN OR FOG HORN USED ON TROUVÉ'S ELECTRIC BOAT.

and it consists of a small magneto motor *D*, and the usual pair of disks, with oblique holes *C* and *B*. By pressing a contact button, the current is sent through the motor, and sets the siren in motion. The trumpet of the latter is mounted on a stand, so that it can be swiveled in all directions, the cables being protected by an india-rubber tube. The inventor claims that the sound produced by this siren is extremely intense, and cannot be mistaken for any of the existing signals.

A Portable Electric Lighting Plant.

We illustrate on inside pages three sets of electrical appliances designed by Messrs. Peterson & Cooper, of London, which constitute a good example of a practical and portable plant, which is to be set up in a palace in India. The generating plant consists of a Phœnix dynamo coupled direct to a Gwynne Invincible engine. The dynamo and engine, with the boiler, are mounted on a strong cast iron bed-plate. Besides the feed pump driven by the engine, an injector is fitted on the boiler, so that in case of accident to one or other of feed-water appliances no stoppage is incurred. The engine cylinder is 4½ in. diameter, with 4½ in. stroke, the speed of working being 400 revolutions per minute. At this speed the dynamo generates a current of 50 amperes, at an electromotive force of 65 volts. The lamps used are 60-volt 20 candle-power incandescent. The steam pressure is 80 lbs. per square inch.

The female figure is of bronze, and was executed by a Parisian artist. It stands on a pedestal of black marble, and holds aloft a cluster of 50 lamps of 20 candle-power, enclosed in tulip-shaped shades. The figure stands in the court of the palace, while a Pilsen lamp of 3,000 candle-power is hanging in the great hall, or council chamber. The cluster of 50 lamps is movable, and the bracket can be screwed off to allow of another with 20 lamps being substituted. The Pilsen lamp, which is provided with an opalescent globe and gilded coronet (Fig. 3), takes a current of 30 amperes at an E.M.F. of 50 volts, a resistance of half an ohm being placed in the circuit of the lamp to enable it to feed properly. The generating plant is capable of supplying current for the arc lamp and the cluster of twenty lamps at the same time, or of supplying the current for the cluster of fifty lamps alone.

THE ELECTRIC LIGHT.

Proceedings of the National Association in Philadelphia.

UNUSUALLY LARGE ATTENDANCE AND INTERESTING PAPERS DISCUSSED.

Brilliant Display of Electric Light.

OFFICERS ELECTED FOR ENSUING YEAR, AND BOSTON SELECTED FOR NEXT MEETING.

TUESDAY'S PREAMBLE FROM PHILADELPHIA.

The hour has arrived, and the Convention is here. Philadelphia, in the vicinity of Broad street, is the center of an electrical commotion that astonishes the staid inhabitants. When the conversation turns, as it often does, with snappy vigor in the direction that calls for words peculiar to electrical nomenclature, the average listener stands appalled. Philadelphia has in herself proven a magnet, and the attendance is large. In fact, this is the greatest attack of Convention that the city has had in many days, and it is lively always. There is nothing phlegmatic in a gathering of men who are engaged in the utilization of a force which is proverbially as well as actually "quick as lightning." The unities would not be in keeping were it otherwise.

An association of men, banded together as this one is banded, not for mercenary purposes, not that this or that or the other method or system of apparatus may be sold, has a higher and nobler object in view, and an incentive beyond that of immediate gain through trade. The exchange of ideas, the discussion of facts, the explanation of electrical phenomena—these are the ends sought, the means employed by the gentlemen scientists of the Electric Light Association which to-day honors the city of Franklin by assembling at the shrine of America's first famous electrician to conduct its deliberations.

The Executive Committee met at 3.30 o'clock Monday afternoon, and decided to lease the assembly room of the Union League, just opposite the hotel, for the meetings of the Association. The following programme was decided upon, subject to change:

1st.—"Legal Report." Arthur Steuart, of Baltimore.

2d.—"Popular Prejudice Against Electric Light Wires." E. R. Weeks, Kansas City, Mo.

3d.—"For High Insulation." C. C. Haskins, of Chicago, consulting electrician ELECTRICAL REVIEW.

4th.—"Electric Motors." By F. J. Sprague, of New York; Wm. Baxter, Jr.,

Baltimore; Prof. N. H. Edgerton, Philadelphia.

5th.—"Transmission of Power by Belting." H. J. Shay, Chicago (Munson & Co., belting manufacturers).

6th.—"Incandescent Lighting from Arc Circuits." Joseph Weltzer, New York.

7th.—"Underground Wires." George Wiley, of New York. (Standard Underground Cable Co).

8th.—"Distribution of Electrical Energy by Means of Secondary Generators." Dr. Otto Moses, of New York.

9th.—"Electrical Education." Dr. Duncan, of Johns Hopkins University, Baltimore.

Tuesday's Session.

The handsome hall of the Union League Club was well filled by the hour of noon, when President J. F. Morrison called the Convention to order.

The opening address of President Morrison was as follows:

Gentlemen of the Convention—Under the resolutions passed at the Detroit meeting, the National Electric Light Association is called in convention in this goodly city of Philadelphia.

The history of the Association shows a yearly increase in numbers, in influence and in financial standing. An exhibit of its progress ought to be a source of gratification, not only to those who have devoted their time, their money and their intelligence to this Association in Chicago in 1885, but to those who have from time to time come into its ranks to swell its numbers, extend its influence, and strengthen its financial condition.

In February, 1885, at the Chicago meeting, 53 companies were represented; at the New York meeting 74 companies were represented; at the Baltimore meeting 102 companies were represented; at Detroit, 124; and to day our muster rolls bear the names of 159 representative companies gathered from all parts of the Union.

At the New York meeting the treasurer reported having received for membership fees $620, and expended $415 67. At the Baltimore meeting the collections amounted to $398.38; the expenditures, $537.49, leaving a balance in hand of $860.89.

At the Detroit meeting Mr. De Camp presented the report of Mr. Cooper, treasurer of the Association, which was to the effect that there were $660 in the treasury, with debts amounting, in round numbers, to $1,200; uncollected debts upon the books, $650. Today the report of the secretary shows all the bills against the Association paid, and a balance on hand of $250.50.

Little or no improvement has been made in either arc or incandescence lighting during the past six months. The attention of investigators has been largely turned in the direction of storage batteries, but on this side of the water little or no progress seems to have been made in that direction. The foreign reports show that storage batteries have been sufficiently perfected to be used both for lighting and power; but in this country, with the exception of an installation of 300 lights in Baltimore, I know of no attempt at any extended lighting from storage batteries up to the present time. Investigation is still being pursued however, in this direction, and I hope and believe that the next twelve months will, at least to some extent, solve the problem of electric lighting from storage batteries.

Very few accidents have occurred arising from electric lighting plants, when we consider the extent to which the service has grown. The management of the various companies throughout the country have during the last few years paid strict attention to the organization of their construction corps, so that the record for the past year closes up fairly good.

In this city it is to be regretted that, owing to defective workmanship in the running of wires in Temple Theater, the destruction of the building was attributed by a competent jury to that cause. This case should be written down as a danger signal by which future operations should be guarded from blunders or carelessness which might produce a like disaster. Taking the record of the year, however, we find that fewer accidents have occurred in the electric lighting business than that of almost any other industry employing a like number of men. (At this point Mr. Morrison read from the Electrical Review, of Feb 12th an extract from the very able paper of Mr. Henry Hine, on "Electricity and Insurance," read before the Electric Club of New York, Feb 3d.)

Mr Morrison then announced the programme as above published, and said:

It is hoped that the Convention will so arrange its hours of meeting as to enable every member to be in his place, and contribute his proper share for its information. With so intelligent a body of men it is hardly necessary for me to say that each subject will be considered calmly and dispassionately, without bias, and with the best judgment of the members of this Association.

The report of the proceedings of this Association are being sought for, not only by all those engaged in the electric lighting business in this country, but many requests from those in England, France and Germany come to us for copies of our proceedings.

With the broad field of the whole world before us, with an audience not confined to those gathered within the walls of this room, but extending over this entire continent, as well as the countries just named, every word should be well weighed, every expression closely guarded, and every meaning clearly expressed before being sent forth as the utterance of this Association.

Portable Electric Light Plant.

One of the subjects which has engrossed the attention of the National Electric Association ever since its organization, has been that of underground wires; and in this connection Prof. Plympton, of the Brooklyn Subway Commission, has presented a most exhaustive report of his observations and investigations in Europe. To none would a perfect system of underground wires be more welcome than to the electric light companies, and all the eyes are turned toward those cities which are making experiment and investigation in that direction. The ground taken by the electric lighting men throughout the country is that, owing to the vast expense attending the placing of wiring underground, they should not be compelled to adopt any ill digested plan; and that hasty legislation, until such ill digested plan had passed beyond the bound of experiment and into the broader field of practical use, would be a great hardship, if not seriously cripple the industry which is yet—one may say—almost in its infancy, although 150,000 arc lights are now burning throughout the streets of this Union.

Col. A. L. Snowden, of Philadelphia, was then introduced by Mr. Thomas Dolan, President of the Philadelphia Brush Company, who made an eloquent address of welcome, in which he reviewed the progress of discovery in the domain of electrical science, and predicted that America would soon add to her other triumphs of invention a perfect storage battery "by which this system of lighting will be carried into general domestic use as the best and most economical of all illuminants of the first quality."

The secretary's report was presented and accepted.

Mr. Allen V. Garratt read the report of the committee on wire gauge, as follows:

WIRE GAUGES.

By Allan V. Garratt.

Mr. President and Gentlemen—Six months ago, in Detroit, when, on the motion of Mr. De Camp, a committee was appointed to still farther investigate and report upon the subject of wire gauge, the first thing in regard to the new committee which struck me was that of all the members present at that Convention I was probably the least fitted to act as chairman and represent the National Electric Light Association before the community in regard to its endeavor to simplify the dire confusion in which the wire gauge question now is.

That conviction has been growing upon me ever since then, and in rendering my report I labor under a certain embarrassment; realizing the large interests involved, and that, perhaps, if we cannot untie this Gordian knot we may have to cut it. I shall, so far as is possible, lay aside personal opinion or prejudice, and voice the opinion of this committee as a whole.

It will be remembered that at the last Convention I suggested that, perhaps, as electric light men use wire chiefly to conduct currents of electricity, a gauge might be devised, the numbers of which should bear a self-evident relation to the resistance of wires of those sizes drawn from copper of commercial purity. For example: No. 4 should indicate, without any calculation, the resistance of a copper wire of that particular size; No. 10 the resistance of that wire, and so on. Although the idea was my own, so far as I know, and I was therefore naturally interested in it, I am frank to confess that after a very careful consideration and much calculating, we have been obliged to abandon the idea as utterly impracticable. And right here let me say that if the report I shall make proves to be of any value to this Association, much of it will be due to the zeal of my associates, Mr. Slatterly and Mr. Stanley.

Having made up our minds that we were on the wrong track, we retraced our steps and carefully considered the other gauges now in use in this country, to see if by a united effort on the part of the large users of wire some present existing gauge could not be brought into universal use; realizing that even a bad gauge in general use is better than half a dozen good ones in partial use. Without going farther into the matter, I will simply say that, in the opinion of this committee, there does not seem to be much hope in this direction.

I have carried on a voluminous correspondence with the large makers and users of wire, a part of which was a circular letter I sent out.

This circular, stated in substance, Mr. Garratt said, was to the effect that a new gauge, based on the decimal division of some standard unit of measure, and that it was thought best to adopt the ten-thousandth of a meter as the standard of measure, and to adopt a gauge the numbers of which shall represent the even ten-thousandths of a meter.

I am pleased to say that a very great many houses heartily endorsed our plan. There were, however, some objections raised, and I will here state the reply of this committee to them before I say much about the gauge we are about to recommend. The objections are as follows:

1st. This Association has already adopted a gauge.

2d. The Brown & Sharpe gauge is good enough.

3d. The 1,000th of an inch gauge is good enough.

4th. An asymptotic gauge would be the best one to adopt.

5th. The gauge must be universal; that is, adapted to all uses of wire.

6th. The difference in diameter between consecutive numbers of the metric gauge is too great for electric light purposes.

7th. Why not adopt the Edison gauge, which has recently been published?

I think it will not be presuming to say that these questions had suggested themselves to us and been discussed long before they were raised as objections by others. It is evident that some of them need no answer at all; in regard to other of these objections I must say a few words to define our position on this question.

[The answers are given in the same numerical order as the objections.]

1st. Mr. W. D. Sargent, General Manager N. Y. & N. J. Telephone Co., says: "After careful consideration we decided to follow the footsteps of our English brethren and recommended that the Association (National Telephone) adopt the 'standard gauge.'

"This was done after a full discussion at our annual meeting at Providence in 1885.

"I am under the impression that the National Electric Light Association adopted the 'standard gauge' also, and regret to learn from your letter that they think of retracing their steps.

"It is my opinion that the action contemplated in your letter will only defer the universal use of but one gauge and add another to the list of gauges already too numerous to be worth mentioning."

Without entering into discussion as to whether we are pushing onward or retracing our steps, as the gentleman would imply, I will simply read from a letter from a manufacturer not far from here:

[Extract from a letter from Alfred T. Moore, manufacturer, &c., Philadelphia.]

"Some time ago the telephone people adopted a standard gauge, but, so far as our experience has gone, we have but one customer using this gauge, and that is the company that brought it out."

I am also assured by other manufacturers that they have not—since this gauge was adopted two years ago—sold a mile of wire by the English standard gauge, unless it be to this particular customer. The proof of the pudding is in the eating. Therefore, your committee does not recommend the continued recognition of the English standard as the adopted gauge of this Association.

2d. There has been but one voice seriously raised to advocate this opinion. Mr. H. B. Thayer, of the Western Electric Co., New York, says, [in substance]:

"This company would much prefer no new gauges be originated. We believe the B. & S. best, and we use it exclusively."

In a second letter: "My letter [above] was not written without due consideration. I see no reason to change my opinion. We object to introducing a new series of numbers, whether better or worse."

We are inclined to agree with Mr. Thayer

in so far that we believe the Brown & Sharpe gauge is the best now in general use in this country; but we also believe that if any one is well qualified to express an opinion on this subject it is Messrs. Brown & Sharpe themselves.

"We believe the 'American Standard Wire Gauge' is the best of its kind in use, because the numbers are in geometric progression. We also believe for English-speaking people longer to adhere to this or any other gauge of its kind."

When the makers and inventors of this gauge admit of their own accord that it has outlived its usefulness, why should we advocate its adoption? Therefore your committee does not recommend the adoption of the Brown & Sharpe gauge by this Association.

3d This is the most serious objection that can be brought against our plan, and I propose to answer it here and now. And in order to do so, I must inquire, is this discussion to establish a unit of measure or is it to establish a wire gauge?

If we are seeking a unit of measure by which things of small dimensions may be accurately measured, and fine working machinery constructed, why then I would say with Romeo:

"In delay we waste our lights in vain, like lamps by day."

But if we are seeking to establish a wire gauge, then the subject merits further discussion. [Here follows the analysis of the question, which fully disposes of that objection. The rest of the report is practically as follows]:

The 4th is only advocated by one party—Capt. O E. Michaels, of the Ordnance Department.

5th. Universality or co-operation are not necessities.

6th. Not considered a valid reason, and the 7th and last, while placing the committee in an embarrassing position, does not make it either incumbent upon them, nor would it be practically what is required. * * *

Let us no longer oblige our working electricians to use a crooked yard stick of no particular length.

REPORT OF THE COMMITTEE ON WIRE GAUGE.

To the National Electric Light Association, Assembled in Convention at Philadelphia, February 15, 1887.

Gentlemen:—Your committee on wire gauge report that after a careful consideration of the whole subject, they recommend as follows:

1. That the British (so called) standard no longer be recognized as the gauge of this Association.

2. That a series of numbers from 1 to 100—each number representing the tenth of a millimeter—be adopted as a gauge in conformity with general use in Continental Europe. This gauge will cover all numbers from 38 to 0000 B. and S.

3. That this gauge come into effect in six months from the present writing, or at the next Convention of this Association.

4. That it be called the National Electric Gauge.

5. That a committee be appointed to properly tabulate this gauge, working out columns of figures representing the sectional area in thousandths of a millimeter; the sectional area in thousandths of an inch; the ohms per thousand feet; the pounds per thousand feet; the ohms per foot; the nearest corresponding number on the Brown & Sharpe gauge, and other information such as shall seem best.

6. That this committee having taken all reasonable precaution to insure the accuracy of their figures, have the table electrotyped and a copy sent to every wire maker in the country, with the request that he publish it in his circular or price list, and mail a copy to his customers on the first day of next July.

7. That the members of this Association pledge themselves to purchase of a reputable gauge-maker, on or before the next Convention of this Association, a gauge or micrometer reading in the numbers of the National Electric Gauge, at a cost not greater than that of gauges and micrometers now made to measure in the thousandths of an inch.

8. That the members of this Association offer to the committee so appointed their hearty encouragement in this not easy undertaking.

Yours very respectfully,
MARMADUKE M. M. SLATTERY,
ALLAN V. GARRATT,
HENRY D. STANLEY.

After finishing the reading of the report Mr. Garratt said:

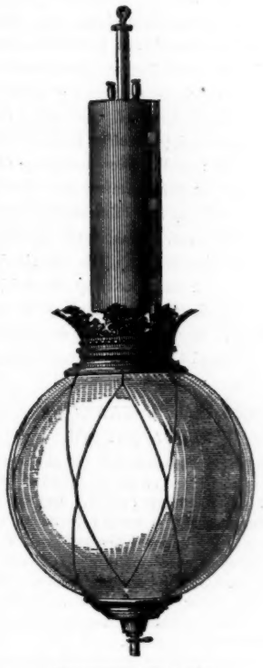
Let us not leave this session without having taken some definite action in this matter, which is so perplexing. Do not let us any longer embarrass our workmen by obliging them to use a crooked yard-stick of no length in particular. (Applause.)

DR. OTTO MOSES: It is with the greatest pleasure that I see the Convention has listened with attention to the report. It shows that our minds have ripened to the point of reaping whatever fruit may be gathered from it. I do not say that that is the particular fruit we want; but it is something like it. It is no longer Dead Sea fruit, such as we have been in the habit of partaking of. There was a committee appointed at the Baltimore Convention, which I think reported during the Convention on that subject, recommending this British gauge. I happened to be a member of it, and the chairman of it, who is present, will bear me out in saying that I then suggested that the future gauge for our adoption would be an electric gauge of some form or other. For convenience, and, as I think the Telephone Association had met, or was about meeting and adopting that gauge, we took it provisionally and with much distrust. I am delighted to see that the matter has been referred to competent persons for consideration, and that they have embodied their ideas in such an elaborate and correct report. However, while making this change, let us be quite sure this time that we are getting something that is on the basis on which we want to calculate—that is the resistance That is the only element the electrician has to consider in regard to his wire. Let it be something that is interchangeable with everything else that is adopted as a scientific standard in electrical measurement. The centimeter gramme second is taken as the basis now of all calculations. Therefore we should have a fraction of a centimeter as a measure. But let us rather consider length than cross-section; that is to say, if we take a unit of length—the meter or the millimeter, or what not—let it be a unit of length commensurate with those units that are now adopted, and we can then interchange every time without the frequent use of the extraction of the square root. As that is a matter which will require some deliberation, I think it would be well to refer this report for speedy action to the Executive Committee, who might act upon it. It is a step in the right direction. Now let us march on in the same direction. (Applause.)

THE PRESIDENT: The committee has shown so much intelligence in its treatment of this subject, the report is so explicit and so straight, that it seems to me that it is the first committee that has fully discharged the duty imposed upon it by the Association. It has convinced me that the first step to be taken is to undo the work which was done at the Baltimore Convention; that leaves the field clear. The next thing is to continue this committee, add to it perhaps a couple more gentlemen, and then when the report goes out, members can read it and come to the next meeting fully prepared to discuss the question. Referring to the first recommendation of the committee, that the British standard no longer be recognized as the gauge of this Association, the report of a committee recommending the adoption of the British standard was adopted. Now let us see if they have adopted it. Is there a man on this floor who has carried that out in practice? (Laughter.) If he has, let us look at him. The reason why they did not do it is that it does not fill the bill. In the shops of the concern that I am connected with in Baltimore the wires have been ordered by thou-andths of an inch. I believe that that is the best system in use to-day. If a better one is provided (and I believe this is a better one), then I will guarantee—I am speaking for myself, not the Association—that we will drop the thousandths of an inch and accept the standard gauge.

If the sixth recommendation of the report be carried out, it will go a long way toward making this the universal gauge, because the place to start this business is with the manufacturer. (Applause.) If you get the body of wire manufacturers in this country to adopt a successful method of measuring the wire, and if they do what is laid out in that report—send out to the wire users this gauge, together with an explanation of why it has been adopted—there is not one man in a thousand who will cavil at its adoption. We have never before had the ground to go upon so clearly defined and backed up by so cogent reasoning as in this report. So, in my mind, if you adopt this report and add two members to the committee, at the next meeting those who will find reasons to disagree with the report will have ample opportunity on the floor to undo anything which has been done, or suggest remedies for any defects which might occur to them in this matter.

NEW DESIGNS BY PETERSON & COOPER.



INCANDESCENT LAMP.

MR. GARRATT: It occurs to me, in view of what you have said, that it would be wise to strike out that paragraph of my report in which it is suggested to authorize an electrotype of this new gauge and distribute it; and in its place I would suggest that the committee which may be appointed be authorized to print a hundred or two copies, and mail them to the leading wire users of the country, instead of going to the expense of having an electrotype made.

MR. L H. WEISSLEDER, of Cincinnati: It would be unfair to the committee to adopt this report, and then at the next semi-annual meeting have the chairman ask how many have adopted this gauge, and it would therefore be a good plan to have all the electric light companies pledge themselves to adopt this after a reasonable length of time, and in the meantime familiarize themselves with the new gauge, and the relation of the new to the old which they have discarded, and let the transition be gradual.

MR. EUSTIS, of Boston: I want to call attention to one thing in regard to wires, and that is that in the drawing of the fine sizes there is a film formed on the outside of the wire. Now, the resistance of that film may be different from the resistance of the core. I herefore, when you take any gauge which is measured on the diameter (which I think is the best way to measure it), your resistance, as so tabulated, is not accurate for the smaller wires. Another point I wanted to speak about is the difference between the British Association ohm and the legal ohm, as we have it here. There is quite a difference between the two. Another question is getting the weight per mile of wire. For the unit of specific gravity we take exactly a cubic foot of water. I have found great difficulty in getting hold of the best authority for the determination of the weight of a cubic foot of water, and also the specific gravity of copper wire. The best authorities I have found seem to point to a specific gravity of $8\frac{9}{10}$. Some of the old tables were printed on 8.879, although so much smaller; so that would be a point which ought to be determined, I think, before any definite standard is taken in regard to the weights.

MR. GARRATT: I intentionally left out of my report and my paper all considerations of the kind suggested, because I think the place for the discussion of those subjects is at the sessions of the committee. This is a business association, not a scientific body. Scientific questions are to be discussed by scientific people in their own meetings.

THE PRESIDENT: Still, a reference by any member to such a subject can be carried away and used for the information of the committee. The suggestion made by Mr. Eustis is, I think, a very valuable one.

On motion of Mr. J. A. Powers, of Troy, it was agreed that four members should be added to the committee.

MR GARRATT: As an especial favor I would ask the privilege of naming two of the members of that committee, Dr. Otto Moses and Mr. E. R. Weeks.

THE PRESIDENT: The committee will stand, Messrs Garratt, Slattery, Stanley, Moses, Weeks, Keilholtz, and Eustis, and if the new members do half as much as the old ones have done, we shall have a most excellent report at the next meeting The question is on the acceptance of the report and the additions to the committee named.

The question was decided in the affirmative.

Mr. C. C. Haskins, of Chicago, was then called for and read the following paper.

Continued on Sixth page.

ELECTRICAL REVIEW

Published at 23 Park Row.
P. O. BOX 3329.

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SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.
Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

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EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.
Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West.
Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, FEBRUARY 19, 1887.

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The villain still pursued 'em. The same wood butcher who illustrated the Detroit papers, arrived at Philadelphia the last day, in the morning, and the members of the Association were astonished by the wild appearance of the countenances of three of the members, Messrs. Morrison, DeCamp and Garratt.

THE ELECTRIC LIGHT ASSOCIATION.

The meeting of the National Electric Light Association which convened at Philadelphia on the 15th instant, proved particularly interesting and encouraging from the standpoint of growth, and assured the success of an institution which was originally suggested with bated breath, and undertaken with mild enthusiasm, if not with faint hearts by all but a half dozen of the prime movers.

The first meeting of the Association was held in Chicago in 1885, with a membership representation of fifty-three companies. To-day the roll shows a membership—a healthy, active, earnest, membership three times that, and the *quidnuncs* who prophesied the downfall of the organization during its infancy, have seen how uncertain is a human forecast in such matters.

A finer body of men of the same numerical strength—men of business and intellectual attainments—Philadelphia has seldom seen gathered together in her midst. They are all, each in his line, an expert in the department which he represents; while the general advancement of the entire community in special particulars, is the evident wish of all; and while emulation of a healthy and proper character is evident on all sides, harmony and union are the watchwords, peace and advancement the battle-cry of the Association. The electric light interests of the entire country are to-day at least a decade in advance of what they would have been, but for the deliberations of the National Electric Light Association.

WONDERFUL PROGRESS OF ELECTRIC LIGHTING.

The best recommendation for the electric light, after its power of illumination, is its power of attracting capital. Capital, we have been taught, is timid; it enters new fields with caution and flies out again at the first alarm, even though it have to stand a serious loss. In other words, capital, unlike principle, never sustains and encourages a losing cause, or one that does not give absolute evidence of success.

No better illustration of this can be had than is furnished in the electric lighting field. When the last census was taken, to wit, in 1880, the census man did not consider the electric lighting investment of sufficient importance to warrant him in collecting the data. Capital was at that time in a condition which might be called undecided, so far as the electric lighting field was concerned. The great promise that had been made for electric lighting by ill-advised persons, had not then been realized, and the difficulties in the way—difficulties which, it should be said, always array themselves in the path of novel enterprises—seemed to present an insuperable barrier to the development which at that time was thoughtlessly promised and is now being realized. We say thoughtlessly promised because whilst such development was not an impossibility in the future, the claims that were made of immediate profits were absurd, and investors unfamiliar with the field and its possibilities, who had been encouraged by these rash promises to come in, were soon stampeded. But there were men with brains as well as capital in the electric-light business. It was enough for them that the prospects were bright without that they got an immediate profit. The demand for the light increased as the apparatus for its distribution was perfected, and as improvement was constant, the business grew; at first, as we have said, it was slow, then faster, until finally it sprang into public favor at a bound, and is now recognized as one of the best paying industries. We say that its rise and progress have been phenomenal, and if any one doubts it let him study the following figures, which we have carefully collected from the best known sources, and are approximately correct.

Amount of investment in voltaic arc plants in the United States on Nov. 1, 1886	$37,000,000
Incandescent plant	15,000,000
Investment by manufacturers of arc and incandescent plants	20,000,000
Invested in manufacturing other apparatus connected with electric-light apparatus, including conduits, cables, etc.	15,000,000
Invested in the manufacture of carbons about	5,000,000
Estimate of the value of patents as made at the Patent Office by experts	15,000,000
Total	$107,000,000

And how long has it taken for this vast sum to be attracted to the electric lighting field? Only six years! Looking at the rate of progress we find that from 1881 to 1882 the business of supplying electric light almost doubled, and has doubled year by year ever since. It cannot, of course, go on at any such rate as this much longer, for, as we know, the doubling process if continued, mounts soon into infinity.

Studying the files of the ELECTRICAL REVIEW, which, because of its accuracy in these matters, has come to be recognized as the best authority, we find that there are over 650 local electric lighting companies in the country to-day.

We have been to no little pains to collect data looking to a reliable estimate of the number of arc lights now aglow in the country, because so many conjectures have been made and so much hap-hazard guesses indulged in. This has not been an easy task, because of the disinclination of some of the arc companies to give their returns. From this survey we discover that at least 125,000 voltaic arc lights are now lighted nightly—a very pretty showing truly!

In the incandescence field a careful estimate, throwing out all figures of projected installations and sticking closely to what is really being accomplished to-day, we find that there are about 640,000 and some odd incandescence lamps aglow to-day in the United States.

The question as to electric lighting popularity has always been one of economy. No one ever doubted that electric lighting would be popular, but many did doubt if it would ever be cheap enough to be generally used. Happily, the cost of distribution, the cost of apparatus and of lamps, has become less and less yearly; indeed, we were about to say monthly, for those who are watching the movement have been surprised to see how quickly one improvement has to give way to another. To-day the cost of an electric lighting plant is less than one-half what it was six years ago, and there is every reason to believe that six years from now almost an equal decrease in cost will have been attained.

Those who have capital for investment should study the wonderful possibilities of the electric lighting field.

CONVENTION NOTES.

The spacious parlors occupied by the REVIEW staff were lighted by a series group of Schuyler incandescent lamps on direct Brush circuit. These lamps of 55 to 200 candle-power gave a beautiful illumination to the handsome rooms. A novel feature of this system of lamp is the cutting out when anything happens—either a break of the filament or of the globe.

Several lamps were broken to exhibit this peculiar feature, and the result was quite satisfactory.

In the front parlor occupied by the REVIEW staff the Little-McDonald cut was shown, with a dozen or more small and a few larger glow lamps. The hall in front was lighted with the larger lamps, and were objects of much interest and admiration.

Giles Brothers exhibited in the same rooms their anti-magnetic shield. What a convincing power there is in seeing. Many who had never been able to comprehend this little safeguard for timepieces were thoroughly convinced of its utility and worth on sight, and confirmed in their convictions by Mr. C. K. Giles' explanations.

Tucked away in a corner a harmless-looking table quietly waited for an opportunity to serve as communicant between New York and Philadelphia — the long-distance telephone with its eight miles of kerite between the cities.

In parlor "C" the Sun Electric Company and the Baxter Motor Company were jointly ensconsced. Light and power, one and indivisible—no, not exactly that, for the latter was running fans, blowers and sewing machines.

In room 211 Day's kerite, in all its varied forms, was exhibited by Messrs. Hotchkiss & Pope. Among other novelties McLaughlin's pliers, from J. H. Bunnell & Co., were shown. Safety to electric light men is insured by the use of these instruments, which insulate the user from electrical contact with current dangers.

Several visits were made to the rooms of the Edgerton Motor Company, corner 13th and Market streets.

The unanimity of opinion on the insulation question, evinced by the reception of the two papers by Inspector Haskins and Vice-President Weeks on Tuesday, is very gratifying to all well-wishers of the electric light enterprise.

No resolutions of thanks, no bouquets is a fundamental rule of the Electric Light Association; otherwise there would have been a dozen members ready to express thanks for the kindness of the Telephone and Telegraph Company for their generous forethought in placing a free long-distance telephone set in the parlor of the Hotel Lafayette for the use of the members of the Association.

Tuesday was election day in Philadelphia. The fellows who won had all the bands in the State, and played everything in the way of a tune, from "Mary had" to Beethoven and Wagner. It was all well enough, but it formed an excuse for a few of the delegates who were a little late next morning. "We slept too near the band."

The worst disappointment of the Association was experienced when the Commissioner of Patents' regrets were read. It was confidently hoped that nothing would occur to prevent his addressing the Convention on patents and patent practices.

"There is nothing like leather," was quite thoroughly demonstrated in the paper read by Mr. Shay, of Munson & Co., Chicago, on belting.

The shortest story told by any member of the Association was called 288. It is *two gross*.

For the benefit of the electrical engineer who hopes to generate many horse-powers from one—a class known to the fraternity as electrical stock raisers—a paper is being prepared by a farmer up at Lexington, who doubled the horse-power on his place in the past few years.

Among the visitors at the Wednesday morning session of the Association were Ichisuke Fujioka, M. E., formerly Professor of Electrical Engineering, and S Yashima, the latter president and the former the electrician of the Tokio, Japan, Electric Light Company. These gentlemen were also interested callers at ELECTRICAL REVIEW headquarters.

Over fifty delegates to the Electric Light Convention came over from Philadelphia in a special car to dine with the Electric Club, and listen to Mr. Stephen D. Field's paper on "Electric Motors," which will appear in our next.

Messrs. E. P. Gleason & Co. had a small but choice exhibit of incandescent lamp shades of various colors.

Room 208, Pittsburgh Carbon Company, represented by George F. Porter, and the Edgerton Motor Company, with Prof. Edgerton and W. E. Sharps, and by way of illumination a dozen of the Schuyler lights with their distribution system complete. A little incandescent branch through into the room worked well.

In 212 the Standard Underground Cable Company, of Pittsburgh, made an excellent display, with G. L. Wiley as demonstrator—a Plato who reasons well.

In 410 and 411, with an annex across the hall, were the headquarters of the C. & C. Motor Company, represented by Mr. Harvey L. Lufkin, a huge blower for blowing objectionable people out in the hall, a lot of sewing machines for leather and cotton goods—a regular factory of shoes and shirts, all lighted up by Swan lamps and Little-McDonald cut-outs, and a number of lady operators on the machines.

A very neat and complete system of acoustic telephone exchange switch-board of the Elgin telephone system was exhibited by the inventor, Mr. William Hubbard, room 408.

William L. Candee, treasurer, and George T. Manson, general agent of the Okonite Company, manufacturers of wire and cables, occupied parlor 104, commodious and elegant headquarters. The layout of the Okonite people was certainly an excellent and varied one.

The Western Electric Company, Chicago, represented by Frank Stewart, exhibited a complete testing set for electric light and other measuring purposes, consisting of twenty-five cells of silver chloride battery and galvanometer, combined with bridges of novel and convenient construction.

The Bridgeport Brass Company was represented by H. D. Stanley, the ever-essential representative of the wire interest, and also delegate from the Bridgeport Electric Light Company.

The Attendants.

The following gentlemen were present during the Convention:

John B. Powell, New York; Geo. L. Beetle, New York; Frank Stewart, Chicago; Frank W. Harrington, Boston; Fred. A. Mason, Bridgeport, Conn.; Henry D. Stanley, Bridgeport, Conn.; Allan V. Garratt, Boston; Clark B. Hotchkiss, New York; J. A. Powers, Troy, N. Y.; Norman McCarty, Troy, N. Y.; E. F. Gennert, New York; C. McIntyre, Newark, N. J.; Fred. Swift, Woburn, Mass.; M. M. M. Slattery, Woburn, Mass.; F. J. Sprague, New York; H. McL. Harding, New York; Chas. R. Truax, New York; Willard L. Candee, New York; Geo. T. Manson, New York; S. J. Fox, New Haven; Jno. F. Noonan, Paterson, N. J.; H. M. Linnell, Hartford, Ct.; Stephen Holbrooke, Philadelphia; W. H. Lawrence, Cleveland, O.; W. C. Hayes, Cleveland, O.; C. D. Smith, Cleveland, O.; J. A. Dalzell, Hartford, Ct.; J. B. Crouse, Cleveland, O.; H. C. Frempt, Philadelphia; A. Partz, Philadelphia; F. E. Pettengill, Cleveland, O.; Fred. A. Gilbert, Boston; Jas. English, New Haven, Ct.; R. W. Pope, New York; E. D. Mullin, Philadelphia; J. H. Shay, Chicago; L. N. Downs, New York; A. J. Dam, New York; Geo. Worthington, New York; Chas. W. Price, New York; C. C. Haskins, Chicago; R. W. Ryan, New York; D. L. Hungerford, Waterbury, Conn.; S. S. Wheeler, New York; H. L. Lufkn, New York; C. W. Gould, New York; Geo. F. Porter, Pittsburgh; A. L. Boyden, Akron, O.; Eugene F. Phillips, Providence; Harry Hall, New York; Eugene T. Lynch, Jr., New York; George L. Wiley, New York; Benj. Rhodes, Niagara Falls; Zack Latshaw, McKeesport, Pa.; L. A. Duncan, Pittsburgh; Henry Hine, New York; Wm. Hine, NewYork; Geo. W. Boyer, Philadelphia; Edw. S Sears, Boston, A. J. De Camp, Philadelphia; Thos. Dolan, Philadelphia; Jesse Smith, Detroit; Jno. C. Weber, Buffalo; Arthur Steuart, Baltimore; H. P. Hungerford, New York; J. F. Kelly, New York; H. W. Spang, Reading, Pa.; J. A. Pentz, Philadelphia; Chas. S. Onderdonk, Philadelphia; W. D. Sargent, Brooklyn; A. S. Hibbard, New York; W. M. Callender, New York; Chisuke Fujioka, M. E., Tokio, Japan; S. Yashima, Tokio, Japan; W. F. Ball, Erie, Pa.; Inspector McDevitt, Philadelphia; W. C. Kerr, New York; Myron Law, Philadelphia; Jno. Lober Welsh, Philadelphia; R. H. C. Hill, Philadelphia; Henry Lewis, Jr., Philadelphia; Prof. W. D. Marks, Philadelphia; J. A. J. Schultz, St. Louis, Mo.; S. B. Richards, Philadelphia; S. O. Richards, Jr., Boston; F. A. Angell, New York; Fred. W. Royce, Washington, D. C.; J. F. Morrison, Baltimore; Benson M. Green, Baltimore; D. H. Tuxworth, Baltimore; Wm. Baxter, Jr., Baltimore; D. E. Evans, Baltimore; T. McCoubray, Baltimore; W. M. McDermott, Baltimore; Pierre O. Keilholtz, Baltimore; T. P. Keck, Savannah, Ga.; Chas. T. Wrightson, Easton, Md.; James H. Covington, Easton, Md.; P. S. Reed, Easton, Pa.; Cyrus O. Baker, Jr., Newark, N. J.; H. A. Cleverly, Philadelphia; D. F. Van Dyke, Philadelphia; H. A. Reed, New York; John Anderson, Binghamton, N. Y.; H. A. Glasier, Chicago; Jno. M. Candee, Poughkeepsie; J. W. Hyde, Springfield, Mass.; H. M. Daggett, Jr., Attleboro, Mass.; Edw. W. Tisdall, Philadelphia; F. A. Sawyer, Portland, Maine; Carl Herring, Philadelphia; W. R. Kimball, Woburn, Mass.; Chas. E. Trump, Philadelphia; Edmund Mather Harrisburgh; A. F. Upton, Boston; H. S. Foster, Philadelphia; C. Griffith Young, Hartford, Conn.; E. F. Peck, Brooklyn, N. Y.; J. Chester Wilson, Altoona, Pa.; W. J. Kerr, Philadelphia; J. L. Barclay, New York; W. L. Silvey, Cincinnati; Joseph R. Simpson, Philadelphia; J. S. Walters, New York; Jno. W. Beane, New York; Ralph W. Pope, New York; F. E. Kinsman, New York; S. E. Barton, Boston; L. Porsh, Newark, N. J.; C. A. G. Riege, Philadelphia; W. C. Bryant, Philadelphia; B. C. Wilkinson, Williamsport, Pa.; Chas. Selden, Baltimore; W. L. Mitchell, Taunton, Mass.; H. A. Pitcher, Philadelphia; H. C. Townsend, New York; C. C. Curtis, Cleveland, O.; J. Potter, Cleveland, O.; C. R. Deacon, Baltimore; H. N. Fenner, Providence; Chas. A. Nichols, Springfield, Mass.; E. R. Weeks, Kansas City; S. H. Weissleder, Cincinnati; Henry Horne, Philadelphia; Chas. Stone, New York; H. B. Sharps, Philadelphia; N. H. Edgerton, Philadelphia; H. H. Eustis, Boston; Dr. Duncan, Johns Hopkins University; O. L. Mitchell, Taunton, Mass.; Dr. Otto Moses, New York.

The Baxter Motor Company.

The Baxter Electric Motor Company had a fine exhibit in parlor C at the Hotel Lafayette. The claims of the inventor are that the efficency of this class of machines is the difference between the amounts put into and taken out of the enterprise, which is certainly a very sensible way of putting it to the unscientific reader.

The electrical efficiency varies with the load and the size of the motor, of course, and the abstract figures in these forms of machine are set by the promotors at from 70 to 90 per cent. Time and circumstances will certainly vary this; and durability is also a very important factor in the calculation—in fact, when boiled down, is *the* efficiency of any piece of mechanical motion. A machine running at 95 per cent. of useful power, which only lasts thirty days, is not certainly as efficient as one in which the returned value of power is only 65 or 70 per cent., but which lasts for years.

This lasting quality, as well as high immediate efficiency, is what is claimed for the Baxter motor; and, in addition, they are self-governing. One on exhibition was run without any load—an idler, so to speak—to illustrate this, and the illustration was certainly perfect.

The wire on the machine is such as to carry a greater current density than that of the generator at the central station, which, of course, will suffer before the motor can be affected, and so save the latter from injury by such causes.

There are other points of excellence, which want of space compels the omission of to-day, but will appear in a subsequent issue.

Visit to Franklin Institute.

The delegates to the Convention were invited to visit the Franklin Institute on its regular meeting night, Wednesday, and proved to be the largest part of the audience. After the routine business, Mr. Pedro D. G. Saloam presented a paper on the Julien system of storage of electricity by accumulators. After rapidly sketching to his audience the inventions of Planté and Faure, he dwelt at considerable length with emphasis and enthusiasm upon the Julien system in contradistinction to other systems of storage batteries. This was followed by discussion of the Gaulard & Gibbs system by Mr. Carl Herring. A discussion followed, in which members tried to obtain some information regarding electrical units of the apparatus exhibited.

In a well-turned speech the Secretary of the Institute alluded to the fact that members of the National Electric Association were present in the audience; whereupon President Morrison arose and responded in his usual happy manner, as follows:

I rise on behalf of the National Electric Light Association to thank you for the invitation kindly extended by the Franklin Institute to us to-night. We accept that invitation with all the more pleasure because of the many matters of an electrical character which have been scientifically treated by your body, and have gone out into the world at large and resulted in immense benefit, not only to electric light interests, but to electric interests also.

As you are aware, sir, myself and my colleagues are in that branch of electricity in which it is applied to illumination and motor power; and we, as a body, heartily thank you for the able assistance you have often given us in this direction, which has given employment to many men, and, as you perceive, has enabled us to grow rich. (Laughter.)

We, as you know, are a traveling institution; to-day we are in the city of "brotherly love," last year in Detroit. In fact, we have been from Illinois to Philadelphia, and are now contemplating gravitating to more civilized centers, such as Boston. (Laughter.) But if ever it is in our power to return your hospitality, I feel that I voice the sentiments of this Convention when I say that nothing will give us greater pleasure. Again, in behalf of the National Electric Light Association, I thank you. (Applause.)

—— In Springfield, Mo., the gas light company, the electric light company, and a legal light, Judge Hubbard, and the light-desiring citizens have had a cotillion. The city, in 1874, made the mistake of granting an exclusive charter to the gas company for lighting the streets of the city. The term of the contract was 20 years. Less than a year ago the Council made a contract with the Springfield Electric Lighting Company for 40 street lamps at $4,137 per annum. Then the gas company rose in wrath and sued out an injunction. Then the city demurred, and the people kicked as they groped in the dark; but the judge held that the contract was good. The case will go to trial, and the city expects to be defeated, but will appeal the case to the Supreme Court.

—— An esteemed contributor sends us the following on the Niagara Falls question: Every once in a while a rumor is started that a station is to be built at Niagara Falls to operate dynamos for supplying Buffalo with current for electric lighting. Circuits about 50 miles in length would be required. No. 6 Stubbs' gauge copper wire has such a resistance (about 1¼ ohms per mile) that 5 miles absorb as much energy as one arc lamp. A 50 lamp circuit would absorb as much power as a 60 lamp circuit of short length. The circuits (20 wires) costing $2,200 per mile for 25 miles would amount to $55,000; 500 arc lamps would be operated by the ten circuits.

Cost of operating from Buffalo to station:

400 horse-power at $35 per year...	$14,000
From Niagara:	
480 horse-power at $10 per year...	$4,800
Interest and depreciation on line, 12 per cent. of $55,000.....	6,600
	$11,400

Annual difference in favor of Niagara station, $2,600.

—— In the Chicago Council, on the 7th, Alderman Dixon presented an ordinance authorizing the Western Edison Light Company to construct and maintain in the streets, alleys, sidewalks, tunnels and public grounds a line or lines of wires to be used for transmitting electricity for the purpose of furnishing light, heat, power and signals. All lines, except when they pass through tunnels, are to be underground and insulated. Any pavement, sidewalk, etc., disturbed must be restored at the expense of the company. A bond of $50,000 is required to indemnify the city for any damages which may accrue. The company must extend its conductors upon any street when ordered to do so by a majority of the Council if there are consumers enough to yield a net revenue of 6 per cent. upon the cost of the extension. Referred to the Committee on Fire and Water.

—— A strong move is now being made by the gas companies of Massachusetts before the Legislature which is now in session, to pass a general act allowing gas companies to introduce electric lights in connection with their gas plants. A hearing was given to the gas companies by the committee on manufactures, at the State House in Boston on Tuesday, the 2d inst. It was fully attended by gas electric-light managers. The American Company was represented at the meeting and favored the measure.

—— The Stillwell & Bierce Co., of Dayton, Ohio, have completed the large addition to their already extensive plant, adding another electric dynamo for the "night turn," that has been working in full force for months past. This firm is celebrated for its water-wheels, both horizontal and turbine, and recently furnished the power for running the largest electric dynamo in the world, located at Lockport, New York.

—— Miss Brennan, of Cincinnati, most skillfully handles a stationary engine. In her examination she made a most excellent record, and it is to be hoped that all who pretend to be engineers are as competent to operate safely a steam boiler under pressure.

—— The Brush-Swan Electric Company of New England have installed a magnificent plant of over 1,000 of their incandescent lamps in the New York Life Insurance Company's building, Broadway and Grand.

—— The Alton Electric Light, Power and Steam Supply Company, at Alton, Ill., has been incorporated. Capital stock, $10,000; with G. N. Black, R. D. Lawrence and S. H. Jones as incorporators.

—— The enterprising little city of Brunswick, Me., has purchased a plant of the Brush-Swan Electric Lighting Company of New England, consisting of 30 arc-lights and 450 incandescent lamps.

—— The Mutual Electric Light Company, of Chicago. Capital, $100,000. E. Purnell, C. A. Vaughn and S. G. Pitkin, incorporators.

—— The Lake Shore Electric Light Company, at Chicago. Capital, $10,000. Incorporators, Wm. C. Beale, E. P. Printice and Robert T. Lincoln.

—— The Electric Illuminating Company, at Chicago, has filed a certificate of increased capital stock from $25,000 to $50,000.

—— The new fire department headquarters of this city is to be lighted throughout by the Brush-Swan incandescent lamps.

Proceedings of Convention, continued from Third page.

"FOR HIGH INSULATION."

By C. C. Haskins.

In the early days of some new enterprise there is ever a swarming of investigators, as to a newly discovered mine of precious metals or gems, and indecent haste is made to arrive first at the goal. We Americans, perhaps no more than people of the old world, are peculiarly marked with this disposition to thus rush in where angels fear to tread

In this headlong race some fall early in the action, some faint by the wayside; but a few, masters of the situation, profiting by experience bought, join earnest industry with business capacity, and win by hard knocks and combative endeavor.

In those early days, however, there are errors of commission or omission, having for their object an economy which in the end often becomes an aggravation, if not a positive pecuniary loss.

The electric lighting enterprise has shown to the civilized world that it has firmly planted roots, and has come to stay. It has passed the preliminary skirmishing incidental to the period of infancy; it has made for itself an honorable record as an earnest, brave combatant, and won its way through the lines of its original enemy—the illuminating gas phalanx—which now meekly holds out its hand to proffer the fraternal grip of partnership; and it numbers among its friends leaders in the army of underwriters—a force which, lacking knowledge, either positive or negative, on the subject, would accept no invitations to the christening of the newborn demon of light.

What has wrought this change? Certainly, a dynamic current, having sufficient energy to maintain an electric lamp circuit of any extent, has the same power for mischief to person or property which it had in those baby days of electric lighting; and there are more persons who "can take the current of a twenty-five light dynamo" than there were five or six years ago, for there are more employed in the business. The loud and boisterous element has largely disappeared. There is in its place a cooler determination to find out and apply the why; there is more research; more applications of safeguards to dangerous or weak points. These have supplanted and stamped out the fuss and feathers that originally dimmed and befogged the glow and warmth of the grand young enterprise.

The electric light men who are the representatives of the many systems known in this association, while they have, up to the present time, fought the good fight earnestly and successfully, have still to continue the noble work, to bring their enterprise up to the level of callings of equal magnitude in other branches of industry.

While commending and applauding the excellent results thus far attained, I trust I may be permitted to hint at a few possible opportunities which seem to me to point at substantial achievements in the future.

I would modestly, but very positively, suggest that a cheap installation—such an one as we can all call to mind, in some other fellow's territory—an installation which at the commencement called for a very modest amount of money; one in which drawer knobs usurped the place of the glass insulator, put on right end up, out of doors; in which what Miller, of Cincinnati, calls undertaker's wire, is strung on telephone knobs along the face of buildings; where, to reinforce the insulation through elevator shafts, under sidewalk crossings, through steam-damp rooms, etc., a wrapping of tape is rubbed down with a lick and a stick, like a postage stamp, to become, as soon as the organic oil has evaporated, of about as much value for the purposes of insulation as a molasses-covered rag; where a dozen similarly ineffectual subterfuges were used by everybody—the present company excepted—that kind of cheap installations are in general the most expensive in the long run, if they manage to live at all.

Better work in the outset is far more satisfactory to patience as well as to pocket, to dynamo man as well as to director.

The use of the wire referred to for outside purposes is a loud-crying evil. In this particular direction but little progress has been made; this relic of the barbarous days of electric lighting still lives.

We, in Chicago, have been accused of having cried wolf when there was no wolf, and afterward, having undergone a change of heart, changed the war cry to something else. Now the facts in the case, I may say in passing, are just this: There was a time when the electric light wires in Chicago were overhead, crossing alleys and streets to some extent, and the cry of wolf was raised. Now the wires, save where they crawl along the fronts of buildings, are out of the way—in conduits, in cables under sidewalks away from probable contact. Now the hue and cry is against other wires on account of their mechanical interference with the firemen. These are all on their way below ground, and when they are down there will be neither "wolf" nor "hue and cry" more.

In a recent paper, by Mr. I. N. Miller, this matter of using inside wire for outside purposes is quite thoroughly canvassed; and I wish to call particular attention to a few facts relative to the insulation of the underwriter wire when moistened. Mr. Miller says:

"Careful experiments made by immersing 12 inches of this wire in a 6x8 jar filled with water, the ends extending above the jar so that the water would come in contact with the covering only, shows the following insulating properties:

	Ohms.
After 1 minute's time resistance,	115,000
" 3 " " "	4,170
" 5 " " "	1,770
" 1 hour's " "	280

"One hundred cells of battery were used in making the tests, one pole of the battery being connected with the water in the jar, the other pole with the copper conductor."

I do not believe there is any representative of a well-known electric light system present who considers an insulation of 280 ohms resistance sufficient to protect any unfortunate who grounds the line of a fair-sized arc light circuit through his body at any point in the line; or would like such a wire to rest upon his porch roof or be on terms of particular intimacy with his telephone apparatus.

Yet there are hundreds of just such lines throughout this country, and they now and then get in their work; and there was a time when the makers professed to, and others did believe—on account of its name principally—that underwriter's wire was perfectly and positively safe from every standpoint of person and property. It was cheap, too, but perhaps that had nothing to do with it.

I am aware that the argument may be used, that if it was so extremely dangerous we should hear from it oftener. My answer to that thought is that if we hear of it at all, as a mischief-maker, we will be doing ourselves, as well as the general public, a great good by so arranging and controlling this matter that we shall never hear from it in that capacity at all.

We all thoroughly understand that it is the second ground which does the mischief; but in a well-soaked line of underwriter's wire the second, if not the fortieth leak, is on, and I have seen a case, not in my own bailiwick, where the deductions from rental accounts because of this wet-rag insulation, in one month, would have put kerite wire at every exposed spot, and prevented shutting down for every heavy rain.

Now, the general public when it gets hold of a sensation desires to make the most of it. The newspaper men are no exception. One of the most violent articles on the danger of electric lights I have read was issued by an establishment which was lighted without and within by electricity. The editor wrote it, the printer set it up, the proof-reader read it, and the pressman worked it, all under the electric light; but there was a chance for a sensation; it was out of season for mother-in-law jokes, and the public had to have something. It was a ground hog case. It was a small affair, but it went by telegraph all over the country—an example of what electricity can do.

It knocked a man down. It exasperated or inspired—I never knew which—a newspaper man to write up the story, which was colored as blue as the bluest arc you ever saw, by electric light, and step by step it advanced until the Associated Press sent it flying, scattering it from ocean to ocean, and from Maine to the Gulf of Mexico by electric telegraph.

This sort of thing is what I think we can, and I feel that we should, prevent. In these comparatively young years of this calling, facts or fancies, either, are trumpeted aloud because they are a new form of sensation; and in some instances these statements have taken such firm hold of communities that the authorities have almost to be dogged into sanctioning electric lights within their corporation limits.

It is better to have the good will of a dog than his enmity; and when other circumstances combine for the interest of the party who is trying to pacify the animal, there may be a double incentive for amicable overtures.

The use of some good form of waterproof wire when it is necessary to run a line along the front of a building to an outside lamp, will add greatly to the general insulation of the line It may be joined to the inferior wire—which is first-class, on porcelain knobs, for inside work—at a point inside the building where the storm cannot reach. It will cost a little more, but this expenditure will be amply repaid through the maintenance account, and assist in helping the rental refunding account at a minimum.

There is a deal of very comfortable satisfaction to the electrical department on watch, in the feeling that a rain storm is working no mischief to the plant; that Barkeep's lamps will run till midnight, despite the rain, or that an alarm of fire in the neighborhood has nothing of common origin with the singing dynamo and the little glowing emeralds peeping from under the brushes.

There is comforting assurance in the fact that the danger in handling a live lamp is at a minimum because of good insulation; and there is a growing confidence on the part of the public which reads in its morning paper that somebody, somewhere, was killed by a dynamo current, or that the cause of a conflagration was traced to a wire in some other distant country or town, when that public can point to its own home installations, and say we have never known of an accident here.

The responsible public always demands results. It cares nothing for theories, it must have cold, hard-tempered, crystallized facts, when it comes to matters of business. When these facts are satisfactory the genial public smiles. The smiles of the public are worth money to the electric light fraternity. On the contrary its frowns are irritating and discouraging, while its mutterings and growls are exasperating, if not expensive.

In the old days of fable, somewhere in Wales, if I remember right, there was a race of giants, who, on account of their immense size and strength, had pretty much everything their own way; and to judge of the pictures preserved to us, a pretty rough way it must have been, and at times quite unpleasant to the little people. They rode over, knocked down and dragged out everything in their road, their constant salutation being "get out of the way, or I'll eat you!" As might have been anticipated the race was finally extirpated by the little people, who overpowered them as the Lilliputians did Gulliver. Only one was permitted to live on account of his gentle and harmless disposition, who was recorded as the last and wisest of the giants of Wales.

Electrically speaking, there are little people and there are electrical giants. When one of these giants goes wandering along the street, dodging in at a saloon here or an all-night lodging house there, the little people cringe and shrink as far away from him as possible, but they gnash their teeth and say hard things of the monster. Now and again the huge, hungry creature lets go and drops down to take a bite out of a telephone line, or devours a telegraph switch-board, and shouts "keep out of my way, or I'll eat you."

The telephone affair is a trivial matter intrinsically, and the loss of a switch-board is but a small affair in dollars and cents. But suppose there was a costly edifice consumed or a precious human life sacrificed to the insatiate hunger of the giant. Or suppose, for illustration, the giant were to make a meal of one complete circuit of fire alarm boxes, and deprive an entire district of means by which to call assistance in case of fire. Similar cases have occurred. What then? Would it not have been better otherwise? The public has an excellent memory, and facts like these are stumbling-blocks to progress.

Fortune, in the general distribution of her favors, has seldom made such dispositions of real property as to leave the electric light man entirely independent of the outside public. The unfortunate constructor who is doing his level best to "get there" is often necessitated to ask favors of some purse-proud individual whose life has not unfrequently been made miserable, if not an absolute burden, by the wily telegraph and telephone men, whose ingenuity in whipping the devil round a stump and getting over, under, through and into a piece of tabooed property, is proverbial. Popular prejudice is against the individual who wears climbers, carries a coil of wire on his arm, or wears a gaudy chaplet of huge porcelain beads.

The quantity of current which is unsafe or the pressure which is dangerous is nothing whatever to the average property owner or the unscientific citizen. Once fixed in his belief that a dynamo current passing his house on a wire ten feet above his roof is dangerous, he feels that he knows what he knows, as well as you can teach him, and yet, on the contrary, if he has been fairly dealt with, and experience has shown that the properly insulated wire has made the current which crosses his premises safe—why, the fellow generally averages up about the same as the rest of mankind.

And there is the insurance man too. He is human, as well; and while in his untutored state he may do a deal of floundering and bucking against electricity in the abstract, experience has shown that he is as ready to receive information, when honestly tendered, as anyone.

Since the last meeting of this association I had the pleasure of preparing and reading a paper before the Western Association of Underwriters, on the subject of electric lighting. While there was a remarkable lack of knowledge on the subject, I did not find the gentlemen unreasonable, but, on the contrary, earnest and curious, and anxious to know something of a force of which they had but the most vague ideas; and the thought then occurred to me, that if there were a fraternal exchange of opinion between the two interests, a good fellowship created between the insurance and the electric light people, much good would be the result of the alliance. The two parties are a couple of good fellows who should be well acquainted with each other.

If, as was suggested at the January meeting of The Electrical Club in New York, each of us could capture an insurance man and bring him in to discuss this matter with us—if we could educate them in this matter—I feel certain a strong point would be gained. A timid child will enter and go peacefully to sleep, in a lonely room, if a light is burning, where no persuasion would induce it to venture in the dark; and the insurance agent, no less than the general public, is nervously groping in the dark whenever he discusses the subject of electric illumination.

There is still another incentive, which appeals to the sensitive electric light man's feelings, and argues potently in favor of better average insulation.

You have probably all noticed the different action of the lamps on a central plant circuit, when in the one instance the rag-wrapped wire was well soaked by summer rains, and

in another instance the air was crisp and dry in the hard frozen season. The coal-pile, too, feels the effect, and so does the patron.

With the mercury skirmishing for a few hours in the neighborhood of zero, what was nearly no insulation becomes a matter of megohms. All electric wires show this result, from the pigmy telephone and short distance lines up to the fire-alarm and long telegraph systems. In such weather, during the cold snap in January, direct telegraphing was done, not as an experiment, but as business, between Toronto and Victoria, British Columbia. The frozen condition of affairs generally along the line conserves to the wire itself all or nearly all the electrical energy which the generator furnishes for the use of the electro-magnets or the chemical solution of the receiving apparatus.

Now, if the tension, the electrical pressure of a telegraph battery, is capable of forcing itself away from a conductor of far more than ample capacity, to escape down a pole to ground during a rain, what are the possibilities to a dynamo current so many times more energetic both as to pressure and quantity, when its route to earth is across half an inch or so of the knob, through a soaked thread wrapping to the wet wood, iron, brick or stone, to which it is made fast at intervals of only a few feet.

A still further reason for high insulation is well illustrated by a recent occurrence in Chicago.

A church edifice there was discovered on fire at about 3 o'clock in the morning. The conflagration was a stubborn one, which, when finally conquered, was explained by the fact of its having been burning some hours, and the fire had worked its way upward pretty much all over the house through the partitions, and the evidence was plain that it occurred immediately under the floor in the basement.

Immediately over the main entrance there was a single arc light on a central plant. The wires to this ran parallel the entire length of the building on the joists within three feet of the hole in the floor.

The fire broke out at three in the morning, and showed that it might have been burning since before the plant was shut down at midnight. No other cause being found, the electric light wires were at once accused of the mischief, and it was only by showing the fact that while the heat had melted off the lead and boiled out the filling of the cable, the wires were all in place on the knobs, unbroken—somewhat disfigured, but still in the ring.

Now, had that fire burned through the floor, three feet farther to the north, no theory would have held water for an instant which denied the assertion made against the electric current.

The cause of the fire is to day unknown, but electricity was discharged and declared innocent by the court of inquiry.

I have endeavored to show from several standpoints the necessity, as I contend, for high insulation, and I shall bring this paper to a close by offering for your consideration a suggestion which, while I am aware it is not entirely new, has one feature which I have not met with elsewhere. It is simply this: Provide your superintendent, engineer, inspector or the proper employe, by whatever name you may call him, with proper reliable instruments for measuring the insulation resistance of your lines. In saying proper instruments, I trust no one will for a moment believe that I mean a magneto. A combination of galvanometer with twenty cells of silver chloride battery in one box and a Wheatstone bridge in another will give you an outfit with which any measuring can be done, from small fractions of an ohm up to over a megohm.

With the apparatus a record book, ruled for date, number of circuit, number of ohms and a large space for remarks.

Let the measurements be made at least twice a week, or, still better, oftener, and the record made whether up to or below the standard. In the latter case when the trouble is found, full particulars should be entered in the remarks column.

Now, if a fire occurs where there is any possibility of an electric wire having contributed to the trouble, that dumb witness, if it has been properly kept, will contribute more hard facts to ward off an unjust accusation than could be shown by your president and the entire board of directors in one long, weary day.

The Convention then took a recess till 4 P. M., the President stating that Mr. Haskin's paper would then be open for discussion.

TUESDAY AFTERNOON SESSION.

The Convention was called to order a few minutes after 4 o'clock, and the President announced as the subject for discussion the paper read by Mr. Haskins.

MR. A. F. MASON, of Malden, Mass.: In conversation with insurance inspectors I am continually hearing something of this sort: "We don't know much about insulation, and we want to know something; we wish there was something authoritative that we could lean on." It has seemed to me that this is the place, and the time has come for some authoritative statement to be made, and I wish to offer a resolution:

Resolved, That a commission of five members of the National Electric Light Association be appointed, whose duties shall be,

1. To determine what qualities are essential to a good insulation for electric light wires.

2. To examine such insulations as may be submitted to it and to determine in what degrees the different insulations submitted possess the virtues required.

3. To report at the next meeting of this Association the results of their investigations.

MR. STEUART, in supporting the resolutions, said: The condition of the wires will determine the question of the responsibility of an electric light company for damage caused by fire or for loss of life or limb. If it be proved that it was within the power of the company to have its wires in a safe condition, and that they were not in a safe condition, and that the accident resulted from that cause, the electric light company will be held for the damage. Therefore I think it is very important that this committee should be appointed, and that this Association should take broad and decided ground with reference to the character of the insulators that should and must be used by its members as well as those who are outside.

PROF. EDWIN J. HOUSTON: I was not present at the meeting this morning, and I rise to ask whether the discussion related entirely to the subject of insulation. It seems to me that an electric light wire to be safe, should possess three properties. It should not only possess high insulation, but it should be impervious to moisture and should be incombustible. Impermeability to water is generally found connected with conductors that are highly combustible; whether or not these properties can all be found in one and the same conductor, I am unable to say.

THE PRESIDENT: The question at issue was mainly what was understood by insulation—insulation against wet, to prevent the jumping of current from one wire to another, or to the ground. Then would come in the question of fireproof insulation.

MR. WEISSLEDER: Suppose that on this street there was common underwriter's wire strung from pole to pole and not in contact with any building, but there is an accidental breakage of a telephone wire which falls across the electric light wire, in wet weather, that sets a building on fire or injures somebody. Would it be reasonable to assume that the electric light company ought to have removed all its wires from the poles, even where there was only the remotest possibility of damage occurring from an accidental breakage of a telephone wire. That is the question that presents itself to me.

MR. HASKINS: It strikes me the gentleman is crossing the bridge before he gets to it. The resolution simply calls for the appointment of a committee to inquire into the subject of insulation and report to the Association.

MR. CALLENDER: I move to strike out the second clause of the resolution. I do not think the committee ought to determine what kind of insulation should be used, any more than that a committee should be appointed to examine into which kind of dynamo is the best or which kind of lamp should be used.

Mr. Callender's amendment was seconded by Mr. Weissleder.

MR. DE CAMP thought the part proposed to be stricken out the most essential part of the resolution.

After some further remarks by Messrs. Sears, Mason and Houston, Mr. Callender's amendment was put and lost.

The resolution as originally proposed was then put and carried, and the following committee appointed:

Prof. Houston, Mr. Carl Herring, Mr. M. M. Garver, Prof. Marks, and Mr. R. T. Robinson.

MR. E. R. WEEKS read the following paper:

"POPULAR PREJUDICE AGAINST ELECTRIC LIGHT WIRES."

BY EDWIN R. WEEKS, OF KANSAS CITY.

The long line of martyrs to newly-discovered facts gives ample proof of the tendency of man to adhere to the old and fear and reject the new. Even in this nineteenth century of progress, when invention presses on invention, discovery on discovery, the latest and one of the greatest discoveries feels the impulse of doubt and opposition and popular prejudice, the old summation of ignorance cries out against electric lighting.

It is true that the superiority of the illuminating properties of electricity has brought about its use to a remarkable extent, yet the prejudice against the methods of general distribution bids fair not only to hinder its widespread adoption, but to result in legislation that may retard our industry, or burden it so heavily that the small beginnings upon which we must depend for the general diffusion of the electric light will be prevented by the great cost of construction and maintenance. It behooves us, then, to inquire into the causes of this prejudice and to discover its remedies.

It must be admitted that there is an element of danger connected with our business. But the same is true of all modern devices that have materially assisted progress. Now that we fully comprehe d the power of steam, we can only wonder that its applications met with no more opposition than they did. But every one thought he knew what steam was, while electricity is an unknown, invisible agent which the popular mind holds in awe nearly akin to that which led the ancients to propitiate the god of thunder.

The element of danger is therefore magnified to vast proportions, and this result, combined with an utter ignorance of the nature and laws of electricity, makes a strong case against a force in regard to which the wisest have much to learn.

To realize the feeling of the public toward this industry, consider our chances as defendant before a jury in an action for damages to life, limb or property.

Were the jury chosen even from the average of intelligence instead of from the usual stratum, the chances of a verdict for defendant would be but one in ten thousand, though all the expert testimony were clearly against the plaintiff.

Again, this element of danger has been increased by careless workmanship and negligent maintenance. Unavoidable ignorance of best methods of managing machinery, running wires, etc., has led to much unsatisfactory service, and some loss of life and property, though in an insignificant proportion when compared with that which attended the early history of gas and steam. But these causes can no longer be pleaded as an ample excuse, for, although no system of electric lighting has attained perfection, the safest and most efficient methods of construction are well known, and the poor workmanship seen in the lines in many of our cities, the temporizing resorts and money-saving devices in an industry that needs perfection in all its parts, prove that complaints against us are not wholly without foundation.

Much of the popular prejudice against electric lighting apparatus is the outgrowth of the opposition that this branch of electric industry has met with from gas interests and in quarters from which we had reason to expect a most kindly welcome and considerate treatment. It is true that light wires conveying currents of high tension or enormous quantity are not very desirable neighbors for either telephone or telegraph lines, but the commodity they carry is just as valuable to commerce, and to the convenience of the public, and has the same right to existence, to accommodation, as have the "great conveyers" of the present age. It might seem strange that we have met with such unkind treatment from our cousins in these kindred industries. Yet from time to time we find newspaper articles and reportorial interviews with telegraph and telephone men, the reliability and animus of which may be judged by the following extract from an interview with a prominent telephone manager not a thousand miles from Detroit: "How about electric lights?" "Well, that's a different thing. The arc circuit in which the most brilliant lights are placed is a constant danger when the lights are burning. There is present in the wire itself sufficient electricity to kill any man. You don't have to wait for lightning to come along. The lightning is there. Many a lamp trimmer rues the day when he first went into electricity, and the chances for paralysis of the man who handles electric lights are a thousand to one in the case of a man who handles telephones. Yes, there have been a number of fatal cases in that line of business. I knew one man who used to trim the lights on top of the 150-foot mast in Union Square, New York. One day he was trimming the lamps, and some people who were watching him saw him topple over and fall to the ground. It was not a mismove, but a let go. Well, the company said he had heart disease, or a fit, but it was just electricity that killed him. I think, though, that the greatest danger is in case of a fire. I have known a number of firemen to be knocked down and quite severely hurt at fires by the electricity from electric light wires. The fireman may be holding the brass nozzle of a hose, and the water may be striking a wire through which a strong current is passing. Presently the wire breaks, or some one turns off the electricity, and the current will run down the stream of water and pass through the body of the fireman, perhaps seriously injuring him These conditions are not unusual at a fire, and are impossible for a fireman to guard against. It is really far more important that electric light wires should be put underground than either telegraph or telephone wires. It would interfere far less with the former business than with either of the latter."

Such a tissue of misstatements and rank ignorance seems, to those who know the truth, to need no refutation. But the masses have no technical knowledge by which to judge of the utter falsity and absurdity of the whole thing, and therefore the result in forming a public opinion is highly prejudicial to our interests; for people are willing to have their fears fed by those who will.

If these are some of the chief causes that have led to the popular prejudice against electric light wires, the remedy is plain.

Let there be better construction in putting up poles and in running wires. Let there be a rigorous exclusion of all make shift devices. Let the entrances to buildings be made in the neatest, most inconspicuous and above all, safest way. Let grounds and crosses be rendered impossible except under circumstances beyond human control.

Maintenance should be looked after with such vigilance that the evils attendant upon the necessary crudity of much of our apparatus be reduced to a minimum.

A thorough system of inspection should be instituted in order to quickly detect and correct trouble; complaints from any quarter should be patiently heard and the causes removed as soon as possible. In other words by the best construction, by ready, constant and obliging attention we should seek to render the unavoidable imperfections of service and immaturity of our apparatus less apparent.

One of the most weighty causes of prejudice would be done away with if a more fraternal spirit among the various electric industries could be created. All should work together for the common good. Each adaptation of electricity has its special needs which every other is bound to respect, and nothing is gained by attempts to exclude any one of them. Each is necessary to the present, and each is here to stay. Each has its own weakness which can neither be hidden nor cured by attacks on the others.

The members of this Association may accomplish much in one direction at least, and that by working for the enlightenment of the general public as to the agent we employ. Only through such enlightenment can we hope for justice, either in the courts or at the bar of public opinion.

As people more fully understand the character and usefulness of this force, its channels of operations, how perfectly it may be controlled, and the many advantages of its adaptations for lighting, most of the prejudice against it will disappear.

The telegraph and telephone industries have been fully explained to the public in popular treatises; but we have been somewhat remiss in this respect. The promoters of electric lighting have been so occupied in introducing their apparatus that they have confined their writings to technical journals and have left the instruction of the public to such teachers as the one above quoted.

(Applause.)

The secretary read a communication from the Franklin Institute inviting the members of the Convention to be present at a meeting of the Institute to be held the following evening, and placing the library and reading room of the Institute at the disposal of the members.

The invitation was, on motion of Dr. Moses, accepted, with the thanks of the Association.

The discussion of Mr. Weeks' paper was then opened by President Morrison, who observed that two things made cheap work possible—sharp competition and bad pay. He continued: I know of parent companies who are not able to get a sufficient number of men to allow them to use their names for incorporators for the company, and they paid them in stock of the company that they organized. They induced these men to lend their names for this purpose. They furnished the money to establish the plant and they did then and do now a losing business. They not only do this losing business themselves, but by this sort of competition have injured the business of the honest electric light companies who have put up dollar for dollar of their capital and employed it in a *bona fide* interest in the locality. Now there is the disease. We have endeavored to apply the remedy through the National Electric Light Association. That is put in a crude sort of a way, but when you boil it down you will find there's bones in it. (Laughter.)

A communication was read from Mr. S. E. Barton, Chairman of the Committee on Electric Lights of the New England Insurance Exchange.

Prof. Houston discussed the subject at considerable length. He said it was clear that the electric light which had appeared in almost every decade since 1800, only to vanish again, had at last come to stay. He dwelt upon its safety and superiority as an illuminant to other artificial means of lighting. Electric light companies should not only court, but insist upon, the fullest degree of inspection the underwriters can possibly ask. The electric light wires, now a source of so much concern to newspaper men, are only a tithe of the wires that the increase he anticipated in electric business would necessitate ten years hence. He did not think the difficulty as regards the dangers coming from electric wires will be removed by putting them underground. (Applause.) "On the contrary," he continued, "I am confident that the time will come when the dear public will sing a very different song from what it is now singing on the subject.

If any law shall be passed (and there are inklings of such a law) restricting the highest electromotive force on any line to 250 or 300 volts, the progress of arc lighting in this country would, in his opinion, be completely barred. Even such a limitation would not prevent the accidents it was intended to prevent, if it were true, as there was reason to believe, that the average person who is killed by an electric light current is not killed by a current normally generated by the machine, but most probably by the extra spark produced on breaking the contact. A machine capable of only giving a few hundred volts would, if the circuit were suddenly broken, probably produce several thousand volts.

Dr. Moses, in the course of a brief discussion, suggested as the probable cause of the Temple fire in Philadelphia that some one, in his zeal for giving a finer illumination at a certain point, had put on a socket a lamp carrying five times as much current as the wire was calculated to bear.

Mr. Herring thought there must be some bad mistake in the wiring if a lamp carrying five times the amount of current can be placed in the socket, and not fuse the plug.

The Convention then adjourned till Wednesday, at 10 A. M.

Second Day's Proceedings—Wednesday Forenoon.

The Convention was called to order at 10 30 A.M. by President Morrison.

The Secretary read a communication from the Electric Club, of New York, stating that the following resolution had been adopted by the Electric Club.

Resolved, That the President of this Club appoint a committee of five, including the President, to confer with the committee that may be appointed by the National Electric Light Association, to consider the question of uniform rules and regulations to govern the installation of electric light plants; that these committees be requested to confer with the representative underwriters, and that they be solicited to take measures authorizing the appointment of a committee for the consideration of this matter with the committees above named, and that a report will be expected from this committee at the next regular meeting of the Club, March 3d.

The letter stated the following committee had been appointed by the Electric Club: Mr. Geo. W. Hebbard, President of the U. S. Electric Lighting Company; Mr. Geo. W. Stockley, President of the Brush Company; Mr. T. A Edison, of the Edison Company; and Mr. N. T. Pulsifer, of the Mather Electric Company; and the President of the Electric Club, Mr. H. C. Davis.

The communication was referred to the committee of which Professor Houston is president.

Mr. Arthur Steuart, of Baltimore, chairman of the legal committee, submitted a report on Reforms in the Patent System.

Mr. Steuart also read a telegram from the Hon. M. V. Montgomery, Commissioner of Patents, expressing his regret at being unable to be present at the Convention.

A communication from the Edgerton Motor Company was read, inviting the members of the Convention to visit the establishment of the company. The invitation was accepted.

Mr. J. H. Shay, of Munson & Co., Chicago, read the following paper on the Transmission of Power by Belting.

TRANSMISSION OF POWER BY BELTING.

BY J. H. SHAY, OF CHICAGO.

The transmission of power from its origin at the driving well to the receiving pulley or shaft originated, as nearly all mechanical appliances have had their birth, in a necessity, and in their first existence such creations have always been crude and imperfect. Thus we see in ancient pictures that strips of raw hide were used, more or less twisted, perhaps, but with huge, ungainly knots, where the ends of these pieces are connected. From this an advance was made when cordage of imperfect construction became common, a lineal descendant of the twisted thong, or a flat, untanned strip—or series of strips—of raw hide were connected by every conceivable form of knot or other awkward connection.

The time which elapsed before any reasonably fair belting made its appearance may be counted by scores of years, and during that long period, of all the various devices, the most satisfactory had proven to be a tanned leather belt.

Still, the users of belts were not happy over the results obtained, and a radical innovation was made when an iron wire cable or rope made a stir for a comparatively short time, yet except for special purposes it has found little favor. A few of the more serious objections to a wire rope are, perhaps, worth bare mention.

Constant use as a belt will, in a comparatively short time crystallize and render the wire brittle, when it will, of course, refuse to bear the strain and gradually give way.

The repairing of a broken wire cable belt is extremely difficult, and the mended portion is never of the same diameter as before.

When it commences to fail it is but a short time until its ruin is complete; and lastly no round belt has bearing enough to do perfect work where solid hard labor is required of it, and the wire belting is no better than any other round belt on that account.

Other methods of transmitting power by gearing, etc., have had their day; but these have gone out of use, and there is nothing to be gained by discussing these noisy methods. For the past half century these have been gradually disappearing from view, until we have to search for an existing example outside the industrial centers of the world.

The verdict of the mechanical engineer everywhere, when called to sit in judgment on this question, is the same: "There is nothing like leather." Yet there are as many kinds and forms of leather as there are of nearly every other animal product; and while, for some purposes, we know that other leathers are better suited, the fact is undeniable that for strength, durability, ease of repair and adhesion, oak-tanned leather captures the blue ribbon, and stands superior to any other on all occasions.

The first essential is found in the character of the hide. Due care must be exercised in the tannage, and thorough and careful selection of hide must be made to insure evenness of stock. Without particular pains in this last requisite, uniformity in the belt is impossible; for the stock must be reduced to an uniform thickness by splitting, which introduces another fault, weakness, and consequent want of durability.

Having now arrived at the point where the properly selected, tanned and sorted stock is ready for cutting and splicing, we have to decide which of the several methods is best for attaching the various lengths, to form a continuous belt.

There are, as I have intimated, several methods of attaching these—by thongs of lace leather, by wire hooks, by rivets and burs, and finally by scarfing and lapping, the two scarfed surfaces being cemented under pressure. This has been adopted quite generally by Western manufacturers, and any objection to such joints which may have formerly existed, are now set at rest forever, through the use of more recent methods and materials.

There are objections to the three methods first mentioned, which are at once simple and damaging from a mechanical point of view. It goes without saying that belts punched full of holes for either lacing, hooks, rivets or any other appliances for fastening, are weakest at those splices, instead of being strongest. And, again, any inequality, such as must necessarily arise from any one of these fastenings, must result in undue strain on the belt, and give birth to a slapping motion, and thereby reduce the useful work of the power.

We may find still more serious objections further along. When an important belt is properly constructed, properly proportioned and speeded, and receives the attention and care which it deserves, there is scarcely any limit to its durability. The cause of the failure of many large belts may too often be found in some one of the above particulars. Of course there are other things to be considered. It is a mistake to figure too closely on the length or width of an important belt. Do not risk a possibility of slipping, which means heat, and will ruin the best belt made in an astonishingly short time.

It was a few years since the rule among one class of belt customers to depend almost exclusively on rubber for the severe work required in saw mills. This has now fallen into disuse, and has been replaced by leather. This latter proves better adapted for the purpose.

Belting for electric light machinery, to be a success must have characteristics not necessarily found in belting for other purposes. For ordinary machinery, for sawing, turning and planing, etc., there is not that positive necessity for that steady motion which must exist in an electric light belt, to secure satisfactory results. It is my desire to point out a few of these peculiarities, and at the same time particularize some methods of prevention. Perfect uniform motion, other things being equal, means a steady, even electrical force, and this, as I understand it, means uniform, steady light. One acknowledged advantage which pertains to the electric light, more especially to the incandescent form, is its steadiness and freedom from flicker, and to obtain this a uniform belt must be used. This uniform motion of the belt must exist throughout its entire length, not only at the portions between the laps, but in the laps themselves. The presence of anything which would increase the heft or thickness of the belt at the laps is no worse than at any other point, nor any less mischievous. No engineer would consider it an advantage to have the driving pulley out of true a quarter of an inch on one side, and yet this would have probably no worse effect upon the uniformity of the dynamo movement than an additional thickness at the laps of the belt.

Another cause of irregular motion may be found in a slipping belt. A certain amount of suction, of the power known among engineers as vacuum pressure, which of course means atmospheric pressure, is a positive necessity to hold the belt in place, and to make its pull uniform. The more closely the belt hugs the driving pulley, of course the more perfectly and quietly does it accomplish the end sought. Now, it takes but little thought to comprehend, in fact it is apparent on sight, that a belt which is lifted from the pulley every four or five feet, allowing the air to enter the space between the belt and pulley, can only produce unsatisfactory results. Experience has demonstrated that the most perfect remedy for all this irregular action from any of the causes mentioned is in such a union of the laps as is produced in scarf joints, simply relying on the cement; discarding rivets, pegs, wire or any other form of fastening.

To accomplish these results there is still one vital qualification necessary which I have not mentioned. Unless the belt has been properly stretched in the manufacture, the hard, rapid pull of dynamo work will soon render it necessary to take out the slack. This should not be. This proper form of belt is to be had, and the electric light fraternity of the West has quite generally endorsed its use. Of the care of belting in use a few words may not be out of place here. The saturation of belting by any kind of oil is destructive. Belting stock properly prepared needs, occasionally, simply a slight coating on the grain. The dressing ordinarily offered in the market for this purpose is destructive. They are mostly of the mineral oil variety, and contain more or less of those light products of distillation known as naphtha, benzine, etc., and combine readily with many animal and vegetable products, tending to destroy their integrity. There are belt dressings produced, which not only do not injure, but really add to the life and power of the belt.

Without making any invidious comparisons, I may, perhaps, be permitted to say that a special study has been made by a Chicago establishment of the needs of the electric light fraternity, and we who are intimate with the process of manufacturing are convinced that success must everywhere result from an evenly matched, uniformly thick belting.

MR. A. V. GARRATT proposed the following resolution:

Resolved, That the committee on insulation be instructed now to confine their labors to the question of insulating covering for wires, but to treat the question broadly, and that the next semi-annual convention embody in their report a thorough treatment of the problems involved in the setting of dynamos, converters, etc., and such allied information as may seem to them appropriate. Adopted.

THE PRESIDENT: I think it would be well to change the title of that committee; I think it ought to be the proper insulation of wire and the proper installation and construction of plants.

On motion of Mr. Haskins it was agreed that that would be the title of the committee.

On motion of Mr. De Camp it was agreed that a committee of three be appointed to revise and amend the by-laws, and report the same at the next meeting of the committee in August.

A brief paper by Mr. Wm. Baxter, Jr., of Baltimore, on Electric Motors, which treated of the subject in a general way, was read by the Secretary. Mr. Baxter's paper began with a reference to the steam engine and its gradual development since the time it was first invented, 2,000 years ago, and speculated upon what might be the ultimate development of electric motors (which had already in the brief period of their existence attained such a degree of efficiency) when they should have been in the field as long as the steam engine has been. He dwelt especially upon the subject of small motors and their superiority to steam power, owing to the comparatively small space required for their accommodation and other advantages.

PROF. EDGERTON, in the course of a brief discussion of the subject of Mr. Baxter's paper, said: If we look over the field I do not think any man can shut his eyes to the fact that where one man will use electric light, ten men, yes, one hundred men, will use the current for power. The electric light is to all intents and purposes a luxury. A man could get along with gas, if his business fell off or he could use something else, but when you put a motor into his place and put some money in his pocket you have got hold of that man as long as the business continues. I wanted to suggest that this Convention appoint a committee to consider the matter of the price of furnishing current, by the electric light people, and prepare a scale of prices which would be mutually satisfactory, to be offered at our next meeting.

MR. DECAMP: I think that Prof. Edgerton's suggestion that a committee be formed for establishing a scale of prices is a good one. If that committee is formed I will make this suggestion, that they be made up of gentlemen who are doing business under different conditions, and that they make the price that they are able to get for motors on a percentage by way of comparison with the price that they are getting for lights. To illustrate, the scale of prices that we get for motors thus far is about 65 per cent., I think, of our light prices. Now in that 35 per cent. difference we are supposed to have the advantage of the cost of attendance on our lamps, the cost of carbons, and the maintenance of the lamp in good condition. As an offset to that we have the cost of obtaining our motors, which up to the present time we have thought it wise to do ourselves. When the schedule of prices is made up by the different parties doing business under different conditions they should make their report of prices on a percentage of their light business. If a man rents his lights for $10 per month, and is renting his power for 65 per cent. of that, of course he is getting his power very cheap. If that was the only price he could obtain from his customers it would not be any guide where we have to give more for our lights.

MR. DUNCAN, of Pittsburgh: I have no hesitation in stating for the information of the Association that by distribution of power we can obtain twice as much as we can for light. We have no difficulty in placing these motors at all. The demand comes to us; we do not go after it; and furthermore, the satisfaction obtained is such that we have on record in our office statements to this effect: parties who have used these motors for six months as against steam or gas power engines, would be willing to pay twenty-five per cent more for electric power. Of course that was gratuitous on their part, because we certainly ask them next year to step up instead of down.

I do not think that a motor requires any particular attention. An arc light does require particular attention. The carbon setter, if he is a practical man at all, after a training of a week in the shop, with proper directions, can make a round twice a week to every motor in service and give it what attention it requires, and it is part of his duty to make a report as to the condition of the motors, the same as with respect to his carbon setting and his lamps. I think we have arrived at that point where we can safely say that, in large cities, the distribution of power by means of electricity is such that it will pay to run it either as a separate plant or in connection with the lighting business, and it is simply a question whether the lighting people are going to step in and keep in, and keep that question to themselves, or whether they are going to allow someone else to step in and take it as a separate power business. After we placed four or five motors we arrived at the conclusion that it would be a very good thing for the customer to buy the motors; in other words, that it will be a very good thing to have the customer interested in the business, and I can say that so far a majority of our motors are owned by the subscribers, and that one person in their employ is directed to give proper attention and care to the motor, and that we make an inspection and see that they do not crowd on more work than we guarantee. (Applause).

PRESIDENT MORRISON pointed out the impossibility of having steam power so arranged as to be distributed in localities in large cities where rents are low, and where the small manufacturers which it is the policy of municipal legislation to encourage, could be established, if the power to operate them could be obtained. Electric motors provide the means of supplying this want. He continued: I do not think that any of us have gone sufficiently into this question to be able to say whether the motor business is or is not desirable simply as an adjunct to electric lighting. I do not believe that that question can be solved except by practical work. The nearest thing to practical work that you have heard so far is the report of Mr. Duncan, of Pittsburgh. He tells you that the result has been a profit to his company, and he stands a living witness to the profitableness of the motor business. With the present outlook, I believe the report of the investigators in that field to be in favor of the adoption of motors as the proper method of distributing power.

MR. A. F. UPTON: The whole question of motors, in Boston, has been satifactory in every respect. They are running the elevators two miles from the central station, with the most perfect success. There is now running in Boston about 300 horse-power, and one-third of the whole power is used in transmitting power.

MR. H. MCL. HARDING: Of course, in the power business it is impossible to give any fixed price. In Boston we charge $125 for horse-power per year, for ten hours per day. To show what we mean, we get for a horse-power there on a motor only $75 per year, and that is $6.25 per month; we placed it where we were running in one place nine sewing machines. All we could get from the light rates was $300 per horse-power per year; the highest bill was 80 cents per night. One point which I want to insist on very strongly is: sell your motors, do not rent them. When a motor is placed in a shop, we select some reliable man, and put it in his charge. That man fills the oil cups, and starts it in the morning, and then our inspector goes around at certain intervals and sees that everything is all right. In Boston, from about forty or fifty motors, we are deriving an income which is paying to the Edison Company on their original stock ($100,000) 8 per cent. from power alone. We are selling more ten horse-powers than any others. We guarantee the horse-power of every motor sent out. We are running the largest elevator in Boston—a freight elevator 12 feet long and 6 feet across, going about 60 feet per minute. We are also running a passenger elevator, going 100 feet a minute. Those are both run from one motor of about 15 horse-power. We burn cheap fuel—one ton of screenings, which costs about $2, and one ton Cumberland, costing about $1.50 per ton, all delivered. We use the Jarvis setting, and from that get excellent results. [Laughter and applause.] A large proportion of our business is elevator work, and work that is done in the wholesale part of the city, which at half past four o'clock is almost entirely deserted, and so our power begins to go off about the same time the light comes on. We are not using up one-quarter of the current which we could obtain from the station. We furnish lights in the day time as well as at night.

MR. W. C. KERR: Only when the incandescent station has spread its wires all over the resident portion of the city will it be feasible to load very much beyond your actual capacity. I know of towns where there are electric lighting stations and where the business portion only takes about 400 lights. Take the residences whose occupants evidently spend more than $4,000 a year to live, and the capacity of that town for incandescent lights was about 7,000, yet the business portion took only 400 to 500. Now, when you get 7,000 lights there, that is the time that you can rent above the capacity of your station.

MR DUNCAN: That is a hypothetical case—if you get the 7,000. But in large cities, where you come to do this lighting as a business, you cannot figure on over 33 per cent. in excess of your power.

MR. KERR: I think Mr. Duncan is exactly right for the conditions assumed—for instance, in Pittsburgh.

MR. GARRATT, referring to the statement in Mr. Baxter's paper that the cost of zinc as a fuel was much more than the cost of coal, and that a pound of coal contained more chemical energy than a pound of zinc, observed that at the present time a good working engine does not show at the driving pulley over 13 per cent. of the energy which the coal used under the boiler may contain. No man in his right senses would say that zinc is a cheaper fuel to use than coal; neither would it be wise to say that under no conditions whatever may zinc be burned as a suitable fuel to produce electrical energy. There is a use for zinc as a fuel. It was said here that zinc had not a place, but it has a place, and it fills it.

MR. R. T. MCDONALD, of Fort Wayne, expressed the opinion that the price charged for motors, as compared to the price charged for lights, ought not to be mentioned by the committee which it was proposed to appoint, but they should agree upon what they ought to charge for motors on the basis of the price of coal. He thought it would not be long before a majority of electric light companies would be using motors.

MR. DE CAMP: I move now that a committee be appointed from companies doing business under various conditions. The suggestion I made as to preparing a schedule of prices on a percentage with comparison with the prices obtained for lights was offered with the purpose of allowing the companies who are going to be governed by that scale of prices to determine which was the most profitable business for them to do. Some companies may be getting 50 per cent. more for their motor service than they are for their light service; our percentage is the other way; so that if they make that statement at the time they make their report, it will be a very intelligent guide for any other company to go by.

But while I have the floor, Mr. President, I want to call the attention of the Convention to another point which we have made in our business, and which I have heard no one speak of. For instance: We rent a man five motors. We charge him $6 for them. We rent another man ten motors, and charge him $11. The man that has the ten motors gives up his business, or moves to some point where he cannot utilize his motors, and he sells them to the man who has the five. That man couples them in with his, and we are running sixteen motors and charging the man $6 for them, and he runs them a couple of months without our knowing anything about it.

MR. DUNCAN: Where is your inspection?

MR. DE CAMP: We are not supposed to need any inspection. It occurred to me that that would be very easily overcome by simply putting a cut-out on each motor.

MR. DUNCAN: There is another way of way of overcoming that, and that is to bind the man by his contract.

MR. DE CAMP: He won't stay bound, though.

MR. R. W. POPE: Mr. De Camp's difficulty was obviated by the Gold and Stock Telegraph Co. originally by charging the subscriber $100 for installing the instrument. It was understood in the lease that this did not give him the ownership of the machine. The company retained their machine. They also retained the $100, and the original subscriber retained his privilege of leasing an instrument from the company. This privilege was transferrable. If he could find another party who desired the machine he could make an agreement with him for that right.

THE PRESIDENT stated at this point that the first paper of the afternoon session would be that of Mr. F. J. Sprague, which would be a continuation of the motor question, and Mr. De Camp asked permission to bring up during the afternoon session his resolution for the appointment of a committee to take into consideration the matter of charges of electric light companies for motor service.

MR. W. R. KIMBALL offered some suggestions with respect to the subject of wire gauge for the consideration of the wire gauge committee.

The Convention then took a recess until 2 P. M.

WEDNESDAY AFTERNOON SESSION.

MR. HENRY HINE offered the following resolution, which was seconded by Mr. De Camp, and adopted:

Resolved, First—That the report of the Legal Committee be referred to a committee of five, to be called "the Committee on Patent Legislation."

Second—That it shall be the duty of this committee to carefully consider the report and proposed bill, formulate a plan for the presentation of this matter to Congress, and report at the next session of this Association.

MR. A. F. UPTON read a paper on "Plans for Installing Central Stations."

After the reading of the paper, Mr. De Camp offered the following resolution:

Resolved, That the chair appoint a committee of five having experience in operating motors from central stations to tabulate rates for motor service, their report to be upon the basis of the price received for arc and incandescent light service.

MR. DE CAMP: That report to be received, and considered by the next meeting of the Association.

MR. DUNCAN: I would suggest that it would be well to confine it to stations operating not less than 300 horse-power. I offer that as an amendment.

The amendment was accepted by Mr. De Camp, and the resolution adopted.

THE PRESIDENT: The chair will appoint as a committee on the report of the chairman of the law department Mr. Arthur Steuart, of Baltimore, chairman; Mr. Kerr, of New York; Mr. Ridlon, of Boston, and Mr. Sprague, of New York.

MR. STEUART: Mr. President, please do not be over modest. The committee were very anxious to have you as a member of that committee.

THE PRESIDENT: I shall take great pleasure in appointing Mr. Morrison on that committee.

MR. F. J. SPRAGUE, of New York, then addressed the Convention. His remarks will be published in full in a subsequent issue. In the course of his remarks, he said: I will cite one or two instances to show the economy of the transmission of power by elec-

tricity. There is a firm of chemical dealers —James L. Morgan, I believe—who are running a freight elevator. They have got a three horse-power motor. They work it up to 4½ quite often. Their bills average about $1[illegible].50 per month ; that is, $150 per year in round numbers. Had that motor been used simply to its normal capacity of three horse-power for ten hours a day, their bills would have been about $1,200 a year. So you see the average percentage of the time of the use of their motor is less than 15 per cent.

There you have an example of a motor, the people using it as they please, as many hours a day as they please, and they find by their meter bills that they only use that motor to 15 per cent. of its capacity. Now, we take a great many of these cases—printing offices and burnishing machines, etc., sometimes where they run continuously and where we knew the machine was oftentimes overloaded, and we found this simple fact, that with the whole capacity of motors they average not over 33 per cent. of their capacity. The highest record we had was 51 per cent. In no case did we find, where they used their motor without any let up, that the bill was more than 51 per cent. of the capacity of the motor.

MR. DE CAMP : Will you allow me to ask you as to the distribution of the business ? Was it distributed among the class of people making up the general community ?

MR. SPRAGUE : Yes, sir.

MR. DE CAMP : How many users did it cover ?

MR. SPRAGUE : I don't know ; but it is a thing which holds, no matter how many we take. We took specimen classes of work, that is, elevators and burnishing machines and things of that kind. Now burnishing machines and elevators demand an excess of power for short intervals of time. Now, in a central station for every hundred horse-power that you have got, you can actually distribute from 65 to 70 per cent. of the motor in addition. Probably 65 per cent is a nearer limit when you consider the general distribution. Of course that requires, in the first place, a thoroughly good generator converting 90 per cent. of the electricity delivered at the belt. In those stations you can recover, I say, about 65 to 70 per cent. So it follows that you have about 175 to 180 horse-power which you can contract to deliver for every horse-power you have in the steam engine. The power in Boston costs $30 to $35 per horse-power. Mr. Harding started out to rent motors, charging $125 a year for horse-power. The result is, for nearly 50 machines put in during the last few months, he has sold every one of them. That shows that we have passed the experimental stage. We are no longer dealing with toys or theories. We are dealing with the commercial exploitation of the transmission of power. In New York City we are going to introduce motors to run these Hoe printing presses. We are going to prove that in dealing with these large powers we can do it more economically than it can be done by steam engines. In a spice store it was stated that the reason that they never introduced a steam engine was that the percentage of drying in the material took off their profits, so they introduced electric motors to run their elevators.

MR. DE CAMP : Do I understand that in case I had 100 horse-power in my mill it could be furnished cheaper from an electric motor than it can be furnished by steam ?

MR. SPRAGUE : Yes, if you are running in connection with a central station.

Replying to a question by Mr. Ridlon, Mr. Sprague said : Water power is not the most reliable power in the world. If I were going to deal with a central station, I do not know but that I would sooner deal with a steam station than one running on water.

MR. RHODES : About water power, is it possible to transmit water power to a distance, say, of 10, 15 or 25 miles ?

MR. SPRAGUE : Yes, sir. There is this element to consider in the transmission of power (it is just as practical a question as the transmission of energy by any other means)—the moment that your interest on your plant and the depreciation and the cost of operating exceed or equal the cost of production in the central station, just that moment you want to drop the transmission of power from any given distance. (Applause.) That is, if you want to go from A to B, and that is a distance, say, of two miles, you can transmit that at a certain pressure. If you want to go ten miles, then the question comes in, will my investment and the depreciation cost me more than if I generated my power at that point, no matter whether it is steam or water ? Now there is a great deal of talk about transmitting the power of Niagara Falls to New York City. It never will be done in this wide world. (Applause.) The transmission of power even ten miles does not pay. Coal is too cheap.

MR. WEISSLEDER : How about running a street railway where the conductors are six, eight and ten miles long?

MR. SPRAGUE: You have to work to a potential of four, five, and sometimes six hundred volts to get the highest economy of transmission. There is a point where the saving of the one is just balanced by the increased expense of the other. That moment you want to stop. (Applause.) As an illustration of the practicability of the transmission of power, we are running now, I suppose, in twenty different cities of this country. I have never seen over one-tenth of the machines being run which we have sent out. These machines have been going to the Argentine Republic, to Germany, to Canada, and are now going to Japan. So you see it has gone beyond the experimental stage. I think there is a limit to the electromotive force, and that Deprez has gone beyond that. I think the highest practical limit should be about 2,000 to 3,000 volts at the central station, and 1,000 to 2,000 volts at the motors themselves. With these potentials there is no practical difficulty in dealing with the machines if they are properly built.

MR. RIDLON : Would it be any better to use an alternating current than a constant current—the regular arc current of to-day?

MR. SPRAGUE—While I believe it is possible to run motors on alternating currents, I have not gone far enough into that to state what the results have been.

MR. RIDLON : Would it be of any assistance in running motors on an arc light circuit to use a distributing box, or to use it on an alternating current?

MR. SPRAGUE : No, sir. I do not deny the possibility of running motors on arc light circuits. We are running on that class of circuit, but it is a limited field.

A number of questions were put to Mr. Sprague, which were finally summarized by Mr. Morrison as follows : It is not the intention of Mr. De Camp or any of those present to discuss the motor business as a business exclusively. The question is whether they can take any part of the motor business at a profit, their business being arc lighting. Now having a surplus of power, can that power be utilized at a profit to arc light companies? They do not propose to buy any more machinery; they do not propose to build additional lines, but to utilize the dynamos they have and to utilize the power they have.

MR. SPRAGUE: Unquestionably you could do that, but that limits a man's capacity. and it makes the motor business simply an adjunct to electric lighting. Now that is the great fault with many Edison stations I have had to do with—making the motor business an adjunct to the electric lighting business. If one station I have in mind had taken the capacity of their station a few weeks ago, and run it for motors, they would get double the amount they are getting for light to-day.

MR. LAW: The question with us is whether it is going to pay us to put on any motors or not.

MR. SPRAGUE: Unquestionably; yes, sir; do it, put all the motors you can on the circuits, and the best motor you can get. (Applause.)

After some further remarks by Messrs. Duncan, Powers, Law, and Phelps, the discussion closed.

The Chair appointed the following committee to nominate officers: Mr. Weissleder, of Cincinnati; Mr. Stanley, of Bridgeport; Mr. Powers, of Troy; Mr. Noonan, of Paterson; and Mr. Ridlon, of Boston.

PROF. HOUSTON was requested to address the Convention on motors, and in the course of some very interesting remarks on the subject, he said that he thought inventive genius would before long devise a practical means whereby the burning of coal could be applied directly to the production of electricity, and as soon as that was accomplished the steam engine would become a thing of the past, and would be exhibited in museums as an interesting historical curiosity showing to posterity the clumsy devices with which their ancestors managed to get along.

The Convention then adjourned until the following day, Feb 17th, at 10 A. M.

On the convening of the Association at 10 A.M., an invitation to attend the meeting of the New York Electric Club was accepted.

Mr. Frank Ridlon offered the following :

WHEREAS, The services rendered gratuitously to this Association by Mr. Thomas McCoubray, the Secretary, have been particularly valuable and meritorious, your Executive Committee would recommend the adoption of the following resolution :

Resolved, That the sum of $100 as a partial recompense for his valuable services as Secretary of this Association.

Adopted.

Mr. F. H. Ball, of Erie, Pa., then read the following paper on

CONVERTING THE HEAT ENERGY OF COAL INTO ELECTRICAL ENERGY.

I have been very much interested in the proceedings of the Convention, and it being my first appearance as a member, I have, with some hesitation, asked your indulgence, promising to be very brief.

A subject which cannot but interest us all is the direct transmitting or change of the heat energy of coal into electrical energy.

The present method of this change by means of the steam engine and boiler, is attended by such an enormous loss that there is room for a correspondingly great gain. It is a remarkable fact that the changes from dynamic energy to electrical energy, and from electrical back to dynamic energy are attended with no such loss.

It is well known that an electrical dynamo will transform nearly 100 per cent. of dynamic into electrical energy, and Mr. Sprague told us yesterday that an electric motor will change 90 per cent. of electrical energy back to dynamic energy.

We saw last night at the Franklin Institute that electrical energy may be stored and afterward return 80 per cent. of the amount so stored.

All these losses are small, but unfortunately we must first obtain our energy from the heat energy of coal, and in this process the loss is enormous.

First, we lose a large amount of heat which we are unable to make our boiler absorb.

This I think our friend Mr. Upton will admit, even with the Jarvis furnace.

Then there is a constant loss by radiation.

The greatest source of loss, however, is in the fact that even the best known form of steam engine will transform very little of the heat energy of steam into dynamic energy

Then we have the still further loss in the change from dynamic to electric energy, so that it is questionable if more than 5 per cent. of energy of coal can by the best known methods be transformed to electrical energy. The remaining 90 per cent. is what we are all after

To utilize any considerable amount of this waste means not only to supersede the steam engine, but to entirely revolutionize most of our present methods and appliances, and make many things possible that are now impossible. That this will be done sooner or later seems at least possible, and let no man risk his reputation as a prophet by saying that it will not

If a process is never discovered by which the loss attending the transformation of heat into electric energy may be reduced to correspond with the changes between the other forms of energy, it may be that a very large reduction of this loss by some inexpensive converter will still supersede the steam engine, or make a formidable rival.

The steam engine has done a wonderful work, nevertheless, and when we consider that it is a successful competitor of good water power we shall remember it kindly for the good it has done when we have to lay it aside; and now, just before the steam engine is laid aside for direct conversion of heat energy into electrical energy, I want to announce that a discovery has been made which may be of interest to this Convention.

This will be its first public announcement before appearing in the electrical and mechanical papers.

The discovery is in the direction of bettering the performance of steam engines by obtaining a more uniform speed under varying conditions of both load and boilerpressure.

The better class of engine builders have in some instances claimed that their engines would generate within two or three per cent. up to the rated capacity of the engine. This means at least five or six per cent. before the ultimate capacity is reached.

The discovery to which I have alluded wipes this out entirely.

The matter is one of too great importance to be confined to any one type of engine, or even to one builder, so that engines of the various types and sizes will now be offered under contract by the builder by which he absolutely perfects the engine to the purchaser if any change of load or of pressure shall change the speed of the engine even one revolution, provided the load is not beyond the maximum capacity of the engine.

A letter from Mr. Van Depoele to Mr. G. S Bowen, covering a paper on Transmission of Power, which was read by the secretary. The paper was mostly statisical, and mentioned plants which are claimed successes at Minneapolis; Montgomery, Ala.; Detroit; Windsor, Ont.; Port Huron, Mich.; Scranton, Pa.

Mr. Wetzler read a paper on Incandescent Lights on High Tension Circuits.

Dr. Otto A. Moses followed with a very polished lecture on the Distribution of Energy through Secondary Generators. The doctor paid a high tribute of praise and honor to Faraday and his followers, prefacing his subject proper with a historic *resumé* of the conversion of currents from high to low powers, and *vice versa*. A description, as far as it was possible, considering the seal of secrecy by which he was hampered, of the new form of converter or transformer system of alternate induction power for arc and incandescent lighting was extremely interesting, and held the Association almost spellbound.

The doctor thinks that the power at Niagara may yet be brought to the seaboard, despite some figures which have been made to prove the contrary. He thought the proper way is to carry a high current from the point of its generation along a purchased route, hidden, that people will keep away from it. Only tramps walk on railroad tracks. Then, having the commodity where it is to be used, transform it into such a volume or pressure as is wanted and use it.

The discussion which followed was quite generally participated in by President Morrison and Messrs. Weissleder, Kerr, Curtis, Duncan, and others.

Before the matter had come to any satisfactory termination, Mr. C. J. Kintner, Chief of the Electrical Department of the Patent Office, Washington, was introduced and made a few remarks on the subject which was the subject of Mr. Arthur Steuart's paper on Wednesday, on "Reforms in the Patent System."

Mr. Kintner stated the humiliating fact that the entire outfit of electrical apparatus in his department was worth not more than $500. A considerable portion of this, from his description, is about on par with that in some county hospital

Mr. Kintner, while acknowledging his miserable condition with respect to want of facilities, is heart and hand with the Association in its endeavors, and while the Commissioner of Patents is powerless to do anything, the method adopted by the Association will accomplish the result desired.

Mr. Ichisuki Fujioka, mechanical engineer, and Mr. S. Yashima, of Tokio, Japan, were elected honorary members of the Association.

The former of these gentlemen, who is an accomplished scientist in the line of electricity, made a short address to the Association on electricity in Japan.

The ballot for officers for the ensuing year resulted as follows :

FOR PRESIDENT.

J. F. Morrison, Baltimore, Md.

FOR VICE-PRESIDENTS.

E. R. Weeks, Kansas City, Mo.
A. J. De Camp, Philadelphia, Pa.

FOR SECRETARY.

(To be appointed by the President.)

FOR TREASURER.

Chas. Cooper, Brooklyn, N. Y.

EXECUTIVE COMMITTEE.

F. A. Gilbert, Chairman, Boston, Mass.
George S Bowen, Elgin, Ill.
Frank Ridlon, Boston, Mass.
J. F. Noonan, Paterson, N. J.
Dr. Otto Moses, New York.
Eugene T. Lynch, Jr., New York City.
Stephen Holorooke, Philadelphia, Pa.

At 1:30 P. M. the Convention adjourned. The next meeting of the Association will be held in Boston, Mass.

The Telephone Suit.

PROF. BELL AND THE ADMINISTRATION.

FROM MR. DICKERSON'S ARGUMENT IN CLOSING THE CASE IN THE SUPREME COURT.

This is the old story; the world knows it by heart. It is written in the blood of the martyrs, shed in this holy cause in every age since the eternal conflict between truth and a lie began. It is inscribed on the marble monuments erected by succeeding generations, in hollow mockery of the embittered lives and melancholy deaths of the world's benefactors. James Watt, of whom Lord Brough said that he, not Wellington, conquered Napoleon, traveled through this very vale of humiliation and the shadow of death, and in the bitterness of his heart cried out: "They assail my honor that they may rob me of my profits." But were are they now? He sleeps in that magnificent mausoleum where England gathers her illustrious dead, embalmed in public veneration, and secure of imperishable fame; while long years ago the waters of oblivion had overwhelmed the very names of her traducers with public contempt and imperishable infamy. But in all the records of the past there is none that approaches Bell's—either in glory or in shame—since Alexander conquered the world at the age of thirty years, and was assassinated out of envy and jealousy that he had done so much. Before Professor Bell was thirty years old he had conquered in the world of science, where no dying groans or widow's tears embitter the victory, but where victor and vanquished alike enjoy its fruits. At the Centennial the adulation from the assembled scientists of the world wafted to his senses the foretaste of enduring fame. At the British Association in England he was the admired of all admirers. At home the learned and the great of each city vied with the others to do him honor. The great Napoleon had founded the Volta prize, to be given by the French Government to those who should make inventions of transcendent interest in electricity, upon the recommendation of the Academy of Sciences—it was 50,000 francs and the grand cross. The Academy, for the first time in thirty years, recommended Professor Bell, and he went to Paris to receive it, and there laid upon their table his photophone, by which he talks through a ray of sunlight as far as it can be preserved by lenses. The Heidelberg University, on its five-hundredth anniversary, last year, within ten miles of Reis's home, gave its diploma to "that distinguished man, Alexander Gr. Bell, who has conferred on mankind the great and constantly increasing benefits of labor saved, by his ingenious discovery of the telephone;" while at that very hour the United States Government had a special agent there begging the Germans in vain to take the honor for their own countryman, Reis, and to filch it from America.

But he had done too much for the world, and as Judge Grier eloquently remarked in Goodyear's case, "envy would rob him of the honor and pirates would rob him of the profits of his invention." And while the courts of Great Britain were with "judicial anxiety" striving to save something for the owners of his patent there, because it was a fragment of a "great invention," unfortunately lost to its inventor by a careless publication in England, a conspiracy was hatching at home to rob him of all. The appellants have flourished in their briefs what they call the "executive department's" efforts against us. The infringers pleaded that so-called Government suit in New Orleans as a bar to our action, but the judges made short work of it, saying, "The filing of an information cannot raise the presumption of guilt. No more can the institution of a suit to annul create a presumption of nullity."

Professor Bell has had to meet so formidable an adversary as the Department of Justice, in addition to the vast army of infringers who have attacked him on every side. Calumny has been invoked with its poisoned arrows as the chief weapon of warfare, and the air has been thick with the grossest vituperation for years. The monster Pan, descending from the Arcadian hills with his horrid roar, has joined in the hunt, and drawn after him the inconstant multitude. Amid this infernal din we have toiled on, not daring to look behind us for fear we should lose our way, until at last we have rolled this huge stone to the top of the hill, where we await your judgment on our labors. But alas, that judgment, if it pronounce Professor Bell to be as white as snow, as did the New Orleans judgment, is only the beginning, and our labor will be that of Sysiphus. The roaring demon has succeeded in establishing as a permanency what is now known as the "Bell telephone annex" to the Department of Justice, with a chief salaried by the year, and a host of lieutenants, all sworn in as assistant attorneys-general, paid by the day, or the job, to hunt down this innocent man to death or destruction, if the resources of the Treasury of the United States and the ingenuity of unlimited able counsel can accomplish it.

Every defense in this case is set up to be tried over again in that, with one addition, the House patent referred to in Brother Lowrey's brief, because the "Annex," under the circumstances, is not satisfied with the decisions so far rendered, which Brother Lowrey, the second officer of the annex, characterizes as "a spurious brood." Four weary years were spent in the Drawbaugh case alone, and all must be done again—this time with the Treasury of the United States to pay for the witnesses and reward the efforts of counsel. Gray's miserable fraud must again be pressed against us with numbers of fresh witnesses. Calumnies which have been hissed out in this presence against Professor Bell, sparing not even his venerable parents, are multiplied tenfold in a venal press, and the prospect is dreary. Neither Brother Storrow nor I have life enough or strength enough to go over all this dreadful work again. Before we submit to that, however, we propose to try the question of jurisdiction to the bitter end, and we don't believe it can be done to us—let Pan roar never so loud. But if it can, then younger, stronger, and we may hope wiser and abler men, must take our places, and, guided by our experience and avoiding our errors, defend our clients as well as they can from these fierce assaults.

Meanwhile, Professor Bell contemplates it all in profound astonishment and horror. Day by day, in the public press, and in the official action, he is charged with the most infamous crimes. Writhing in agony he comes to his counsel for protection. We are compelled to tell him that in this free and happy country he can have no protection—that he may be denounced, as he has been in the public newspapers of the highest influence and greatest circulation, as a forger and perjurer, and there is no redress which is not worse than to submit. Mangled and bleeding by some of these fearful accusations, which grow blacker day by day, he has begged us to show him some way in which he can vindicate himself in the eyes of the world which has honored him so much. I have said to him, "Wait—take courage, my friend, and live through it till we can reach the Supreme Court, and then you will be vindicated." But he asks: "How can I live so long and keep silent?" I could only point him to our great example, who in his hour of agony was dumb before His accusers, and opened not His mouth, for His hour had not come.

And now I say to the "Annex" that when this dreadful conflict is over, when the whirlwind of time shall have swept away the clouds and the filth with which we are now surrounded, and when the roaring of the beast shall be heard no more, the name of Alexander Graham Bell will again shine forth, written, as it now is, on the roll of immortals, where but few appear through the ages, and where we read such names as Pythagoras, Euclid, Archimedes, Copernicus, Galileo, Volta, Oersted, Arago, Ampere, Newton, Watt, Faraday and Henry. In future years, when the telephone shall be in every house, as necessary to life as the clothes they wear, and when the name of Bell shall be as familiar in their mouths as household words, it will be wondered at that he was treated so by this "Annex," which has momentarily the power to use the name and the treasury of this great and generous people to persecute him, just as we now wonder when we contemplate that most pathetic picture in history, in which the banished Caius Marius, the savior of Rome, stands on the Carthagenian shore gazing intently on the blue waters of the Mediterranean to that distant land where his lares and penates are desolate, and crying out in his agony, "O Rome, what crime have I committed?" Ah, sirs, the crime he committed is the crime which the benefactors of their race in all ages commit—the crime of having deserved so much that the baser sort at last hate to see them and hear them called "O Agathos"—the just.

INSULATED PLIERS OF J. H. BUNNELL & CO, NEW YORK.

Safety Pliers from the House of J. H. Bunnell & Co.

A new and particularly effective yet simple invention is illustrated on this page, the work of Mr. Charles McLaughlin, of the widely known electrical firm of J. H. Bunnell & Co., of New York. This is an improvement in the matter of linemen's pliers that has often been discussed and demanded, but has never been brought out, to our knowledge, in this form before. Its application will be universal in all line work. The pliers are of the usual size and form, known as Stubs, and are doubly covered and insulated on the handles with a strong and slightly elastic double coating of rubber and rubber tape so vulcanized together that a uniform coating and thoroughly insulated protection is given. This does not at all interfere with the efficiency of the pliers or their convenience in being handled. The company will introduce these pliers in all sizes, and the price will be but slightly increased, will amount to comparatively nothing when the safety assured by the use of the pliers is considered.

*** The communication which the *Herald* (Indianapolis), through its representatives, has had with the manufacturers, jobbers and business men generally during the past few weeks enables it to speak knowingly concerning the telephone matter, which is now awaiting consideration by our legislative bodies. The utility of the service has been seriously impaired in consequence of the telephone law passed by the last legislature, and a general dissatisfaction is expressed. Under the present system telephone communication, especially with outside towns, is struggling against serious drawbacks which are the direct result of the obnoxious law, while the city service can never regain its old-time efficiency until the law is repealed. In the interest of all local industries and all representative business houses, to whom the most efficient telephone service is not only desirable but indispensable, it is hoped that the present legislature will repeal the telephone law.

Telephonic News

*** The Los Angeles (Cal.) Telephone Exchange, it is stated, is to be under the management of Mr. D. B. Macquarrie, former manager of the Kansas City Exchange.

*** In the State Legislature of Illinois, Mr. Baker has introduced a bill in the House which provides that when one telephone is rented by any one person, firm or company no more than $3 per month shall be charged, or when two are rented not more than $2 per month.

*** The business man who maintains a telephone in his office has many friends. The question, "Can I use your telephone a moment?" is asked many times in business hours, and the "hello!" of countless voices is anything but music to the ear. A small fee for the use of the instrument would soon drive away this gratis patronage.

*** An anonymous circular has been mailed to the subscribers of the Providence Telephone Exchange, in which the claim is made that an increase of rates will be made (as the Bell Company is so largely interested in the Providence Company), unless the Legislature of that State prevents it. Not much weight is attached to the circular by the Rhode Island company.

*** Mr. Chas. A. Rolfe, recently from New York, has been made an agent for the Gamewell Fire Alarm Telegraph Company, at Chicago, with E. B. Chandler, general Western representative of the company. Mr. Rolfe's general knowledge of electrical matters will render him a valuable adjunct in the territory where he will hereafter work; while his capability as an agent, on general principles, will win for him and the company he represents both reputation and business.

*** The New York Subway Commission has ordered that work be begun on the following conduits, March 1st, frost permitting: The section beginning at Canal street and Broadway will have 27 ducts, turning at Spring street to West street it will have 15 ducts, and from West street to Fourteenth 10 ducts. The down town section will lead from Cortlandt street and Broadway, by way of Park row, to the Brooklyn Bridge, and the Fifty-eighth street section from First to Eighth avenues will have 15 tubes of zinc, 2½ inches in diameter.

*** A Chicago daily said in substance, the other day, speaking of the telephone patent case, the holders of telephone stock here are fixed in all ways. There is a crowd headed by Ream which as a simon pure speculation has furnished the funds for Prof. Gray to push his litigation. It is with this crowd a play for a big stake with a very small capital. There are a dozen rich men in the syndicate, including one rich newspaper man. They have the control of the stock of the company which would be in the field in case of success in the suit at Washington. All the money they have been called on to contribute is the necessary fund to get good lawyers and to make a good fight in the Supreme Court at Washington. The Bell people have many of them hedged by buying into the Drawbaugh. The Bell people for some reason or other seem to be more respectful toward the Drawbaugh claims than they are toward any of the other opponents. They do this by taking that stock as a hedge. Our Western correspondant has on several occasions called attention to the fact that large quantities of these outside telephone companies' stocks had found its way into the strong boxes of the newspaper fraternity; and inasmuch as according to Burns:

"If self the wavering balance shake,
It's rarely right adjusted."

The animus of the press' attitude toward the Bell Company in this whole matter may at least be suspected.

More Electrical Enterprise.

The Bishop Gutta Percha Company, of New York, has just completed a new laboratory, fitted with the latest and best appliances for actual and experimental tests.

They have engaged the services of Mr. Otto Hoeftmann as electrician and expert in gum insulation. He has been employed by Siemen Bros. & Co., of London, for over twenty-two years, and from 1861 to 1883 was foreman superintendent in the different manufacturing departments of their works.

The machinery and all appliances, both mechanical and chemical, of the Bishop Company will be thoroughly overhauled, improved and supplemented by new, whenever necessary, under the supervision of Mr. Hoeftmann, under whose immediate direction the entire machinery and works of the Siemen Bros. & Co. of London were built.

The Bishop Gutta Percha Company has engaged Mr. Geo. A. Hamilton, chief electrician of the Western Union Telegraph Company, as consulting electrician. All this is entirely supplemental to their previous equipment and facilities. Mr. W. W. Marks will remain in charge of the manufacturing department, with his usual competent corps of assistants.

By thus combining rare experience and talent of two continents, the Bishop Gutta Percha Company confidently hope to be able to meet the constantly increasing demands for high insulation in subterranean, subaqueous and aerial work. Mr. H. N. Reed, the secretary and general manager, is to be congratulated on securing so valuable an addition to the staff of the company, and also on the fact that his efficient work has increased the business of the company over fifty per cent. the past year. This company is one of strength and progressiveness, and deserves the success it is receiving.

The New Telegraph Lines Between New York and Chicago.

It is said in Board of Trade circles that a company of New York and Chicago capitalists is about being organized for the purpose of constructing a lot of telegraph wires for rental.

It is understood that the company will be known as the New York and Chicago Telegraph Company, and that the customers will be brokers and commission men, to whom private lines will be leased at less prices than are now charged by existing companies The wires will be all, or nearly all, through lines, and, of course, with but two offices a thousand miles apart the company might experience some difficulty in keeping the wires up, or searching for a break. These difficulties will be largely obviated by the method adopted. The wires will be made up in a cable, which it is believed will give a total strength equal to a certain guarantee against all storms and other possible interfering causes.

No operators will be employed by the company. The lines will virtually be owned by the leasing parties. Estimates show that at least forty such lines could be leased to private parties for day and night use, at $5,000 each, or $200,000 per annum.

If the arrangement could be made safe to the Board of Trade people, the wires could be kept hot by turning them over to the newspapers at sundown.

Some idea of the amount of revenue there would be may be gleaned from a few facts, as they stand now. Five years ago there were only one or two firms who could afford the luxury of a special wire between the two cities. There are at present nearly a dozen such wires, at an average rental of $20,000 per year. One firm has an office in the Board of Trade building for which it pays annually $18,000 rent, and $10,000 a year for a private wire to New York, and has the credit of dividing a quarter of a million per annum after all expenses are paid; and another concern pays $12,500 for a private wire, and has done so for five years.

Joe Howard and the Gas Bills.

In the New York *World* recently, that brilliant writer, Joe Howard, brought relief to his mind and gave expression to the thought of numberless thousands in publishing an account of his fruitless wrestle with the New York gas authorities. The story runs as follows:

"Well, we'll blow 'em out."

Blow what out?

That's what I am going to tell about. Gas pipes. My gas pipes. The speaker is as well known as any man in town. He is old and thin, and he wears a long, whitish, grizzled beard, a handsome picture of the errant Salathiel, gentle-mannered, soft-spoken. For years he has walked on the eastern side of the city, going into every house on every block for money.

Beggar?

Oh, no. Master, boss. With a nod he can plunge a thousand homes into Cimmerian darkness. He is the autocrat of the gas pipes. So far as light is concerned, he can create and destroy. Thousands upon thousands, hundreds of thousands of dollars he has collected. He knows the name of every customer, he can tell at a glance how much

FIG. 1.—JOE HOWARD AND HIS FRIEND THE GAS MAN.

per month this, that and the other house ought to turn in. He has all the delicacy and the softness and texture of a velvet glove externally, and the iron grip of a vise without a heart, in times of emergency. His ears are hardened. Day after day, week after week, month after month, year after year, decade after decade he has listened to righteous complaints, to murmurs that in time assume the proportions of indignant shouts. The quality of the gas, the quantity of the gas, the absurdity of the bills, the leakages of the pipes, the unreliability of the meters, these are as familiar to him as household words, for they are household words all over his district.

* * * * * * *

I mean to say precisely this: that four burning jets of gas give absolutely no light whatever; that the gas furnished by the charming monopoly that straddles the neck of this community and rides it desperately, is so bad that were it an article of barter and trade in any other line of commerce no customer would accept it. No bill for it could be collected. A butcher serves you with a stringy steak. He takes it back. Your tradesman sends you calico when you ordered silk. He takes it back. Your dressmaker sends you a misfit. Your tailor makes you trousers of no earthly use. They take them back. Your stable sends you a shabby coupe, a raw-boned horse, a dirty driver. He is compelled to furnish what you want or go without his pay.

But the gas——.

The meter may lie, you must pay for it. Your house may be closed and leakages occur. You must pay for them. You turn on every gas-burner in the room, but the quality of the gas is so meager, its consistency so thin and tenuous that you get nothing in the way of light. It makes no difference, you must pay for it.

COME DOWN AT ONCE.

If not?

There is no if about it. You must pay the bill. Why not complain? Nonsense. The first step is taken when the collector, my venerable friend with the silken beard, comes for his dues. Does he say when told that there no light, "I am really very sorry sir; there must be some mistake. We will have your meter examined. We will do this or that?" Does he, like the butcher, apologize and furnish something better; or, like the tradesman recognizing his mistake, rectify it? Oh, no. He is no such man. He wants the money then and there. Getting it, he goes away contented and the subsequent proceedings interest him no more until pay-day of the following month comes around, when the same panorama of complaint, of deaf recognition and shrugging of shoulders is unrolled and the money is collected.

* * * * * * *

Another month rolls on.

COMPLAINING TO THE COMPANY.

The experience of previous months and years is repeated. You personally encounter the collector. You tell him the story. You flatter yourself you have made an impression. Having taken your money, put it in his pocket and receipted your bill, he taps his teeth with his pencil, and then, as though he had discovered the secret of perpetual motion and solved the problem of the century, he says with oracular tone, "Well, we'll blow 'em out."

Blow what out?

The pipes—and he does. The next day a sturdy man with implements in his hands appears upon the threshold, and with much ado and considerable efflorescence of manner, descends to the cellar, toys and dallies with the meter awhile, and then blows out the pipes. He is overwhelmed with thanks, pockets adroitly the modest fee handed him in recognition of his aid and abetment, and vigorously retires.

At night the gas is just as bad, the light is just as poor. You have had your labor for your pains—and that's the end of it.

And there is no remedy.

Surely there must be some remedy.

Surely there is not. You cannot suggest a remedy. Every now and then indignant citizens get together, apparently, and I dare say really, determined to show these monopolies what can be done in the line of decent service of gas. They raise the money, they start a company, they lay their mains—they water their stock and sell out.

New York is cursed with bad gas.

FIG. 2.—HE INTERVIEWS THE COMPANY.

There isn't a house in it that is properly lighted. Experience shows beyond controversy that certain houses in certain localities are expected to turn in so much money, and so much money they do turn in. Let a private family move into a house formerly used for boarders. No matter how small the amount of gas burned, the bill at the end of the month will strike the average of the boarding-house, and not until the fact is explained, not until its new estimate is awarded, will there be any change whatever. Try it. You who are saving of your gas in order that your bills may be small, begin to-day to turn on every burner in your house. Use the gas as freely, waste it, indeed, as you do the Croton, and see if at the end of the month here is the faintest perceptible difference in the size of your bills. Take in boarders Rent room after room. Have sickness in your family. Keep the gas burning all night long. You will find that the average will be the same, be the gas burned more or less. Send your family out of town. Use nothing but oil. Go even further than that and have the gas turned off at the meter, and see if there will be any difference in your gas bills.

* * * New York city, so far as it depends upon gas, is in Egyptian darkness. Public protest, private grumbling, organized opposition amount to nothing.

The word of the gas collector is omnipotent.

Isn't my friend indeed a noted man?

HOWARD.

OUR ROCHESTER LETTER.

To the Editor of Electrical Review:

The telephone difficulty in Syracuse reached a climax on Saturday, the 29th ult. During the several days previous to this time attempts had been made by the management of the Central New York Company, who have succeeded the Syracuse Company, to have Mr. Meyers continue the service as the agent of the Central New York Company at a fixed rental, or for Mr. Meyers to continue the service as the lessee of the Central Company, paying them the royalties he had been paying the Bell Company. This agreement was to run not less than four months nor more than six months, when it is presumable the Central Company would be ready to continue the service with their own plant.

Mr. Meyers refused all overtures, and at ten o'clock, the 29th, the exchange instruments were demanded by the agents of the Bell Telephone Company, to whom they were delivered, thus closing up the exchange.

In view of the fact that Mr. Meyers desires to establish a competitive exchange, and his avowal that he would await the action of the Supreme Court before opening such a system, it was unwise to antagonize the users of the telephone by even a few days' deprivation of the service. He evidently came to this conclusion, for last Wednesday an understanding was arrived at between himself and the Central New York Company by which the service will be continued for a time at least.

Mr. Meyers will lose nothing by the decision. If he had refused to negotiate, his plant would be idle, and an antagonism created that would have seriously affected any later arrangements he may make now. Meantime, if he finds later on he can introduce a competitive system, he will have the good will of the people and an income from a plant that otherwise would have been idle.

The situation in Rochester is very quiet; indeed, with the exception of a bluster now and then, such as the latest on the part of the Citizens' Association of contesting payment of rentals demanded by the telephone company, the plea being that service was not rendered. This action is condemned by the "level-headed" ones of their own membership. The disposition is to retrograde; that is, to do without the telephone. The argument is a very good one, *i. e.*, that merchants have been vacillating, in that too much dependence has been placed on the telephone, and that now, instead of having messengers or express continually going, they think ahead, and make one journey do for several heretofore.

The irrepressible Dorsett has been in Buffalo stirring the people up to a realizing sense of their responsibilities in an underground system.

We hear now and then here in Rochester of the mysterious to-be writing telegraph. It is rumored that the system will be ready for general service very soon.

The electric lighting service moves with the rest of the world. In Buffalo the gas interests seem to see a good thing in electric lighting. The U. S. Company recently made a contract for lighting a building in which was a clause allowing the substitution of gas, in case the electric method failed, at no extra cost. The Brush Company furnish the U. S people the power, as they also do the Westinghouse system. They all seem to work harmoniously, and the inference is natural that their interests are identical.

In isolated lighting, Schmidt, Kaelber & Co. have closed a contract with the Gould Manufacturing Company for a 250-light plant.

The Edison Company here are canvassing the subject of a supplementary station for the resident portion of the east end. The present station is doing all it has machine capacity for doing.

H. F.

Rochester, N. Y., Feb. 7, 1887.

.... A dispatch from San Francisco says: John W. Mackay, of the Postal Telegraph Company, has purchased the Bay and Coast Telegraph line, belonging to the South Pacific Coast Railroad Company, which runs from San Francisco to Santa Cruz. The price paid is not given.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEB. 8, 1887.

357,190 Life-detecting and preserving apparatus; Willard H. Farnham, Minneapolis, and Charles B. Askew, St. Paul, Minn

357,280 Electrical distribution; Wirt B. Harvey, Memphis, Tenn.

357,293 Electric cut-out; Oliver B. Shallenberger, Rochester, Pa.

357,295 Commutator for dynamo-electric machines; George Westinghouse, Jr., and Albert Schmid, Pittsburgh, Pa.

357,296 Electric railway signaling: George Westinghouse, Jr., Pittsburgh, Pa.

357,310 Instrument for transmitting audible time signals; Jacob R. Etter, Crawfordsville, Ind.

357,337 Telephone support; Samuel Rosenblatt, New York, N. Y.

357,359 and 357,360 Telephone transmitter, telephone receiver; William C. Barney, New York, N. Y., assignor to Josiah C. Reiff, same place.

357,372 Electrical fare-box; Walter A. Crowdus, Dallas, Texas.

357,374 Electro-magnetic motor; Wm. H. Darling and Leo Bock, Jr., New York, N. Y., assignor of one-third to Gardner P. Harrington, same place.

357,385 Switch and holder for incandescent electric lamps; William Hochhausen, New York, N. Y.

357,416 Electrical burglar alarm; Gustav Schleicher, Mount Vernon, N. Y., assignor, by mesne assignments, of one-half to Edw. G. and John C. Schleicher, both of same place.

357,452 Telephone transmitter; Francis Blake, Weston, assignor to the American Bell Telephone Company, Boston, Mass.

357,516 Electro-magnetic attraction device for cars; John B. Atwater, Chicago, Ill.

357,538 Spring jack switch; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

357,539 Metallic circuit for multiple switch-boards, and 357,540, local battery circuit for multiple switchboard systems; John A Seely, New York, N. Y., assignor to the Western Electric Company, Chicago, Ill.

357,550 Galvanic battery; Sidney A. Chase, Evart, Mich., assignor of one-half to William R. Mapes, same place.

BUSINESS NOTICE.

Notice is hereby given, that the co-partnership heretofore conducted under the firm-name and title of VALLEE & BRO., at 1210 Market street, has been dissolved by mutual consent, and that a co-partnership between the undersigned has been this day formed under the name and style of VALLEE BROS. & CO., at 932 Arch street, for the purpose of manufacturing and dealing in electrical supplies, and the construction of electrical and pneumatic work of every description. We respectfully ask a continuance of your patronage.

GARRETT A. VALLEE.
GEO. W. VALLEE.
A. V. ZANE, JR.

Your attention is particularly called to our new address, 932 Arch street.

Philadelphia, Jan. 15th, 1887.

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"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.), New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatises on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World*'s Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer*.

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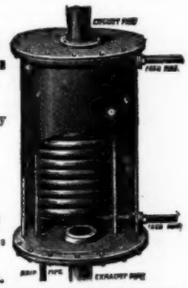

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Fig. 259

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Fig. 255

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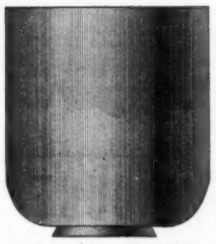

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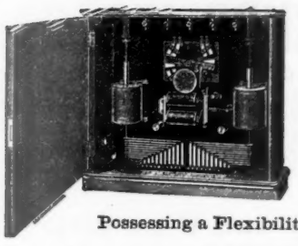

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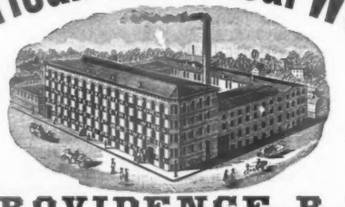

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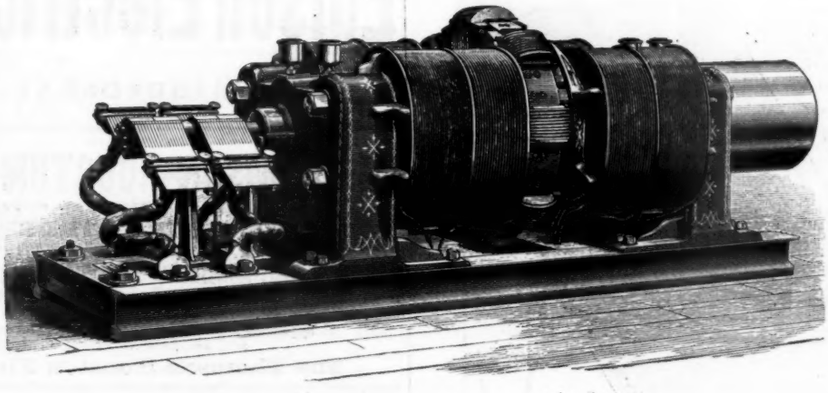

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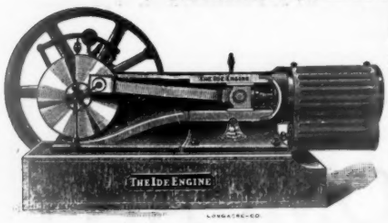

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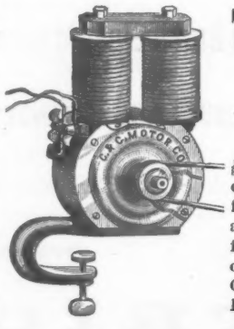

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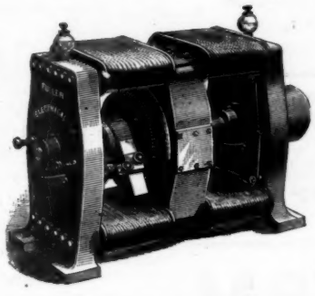

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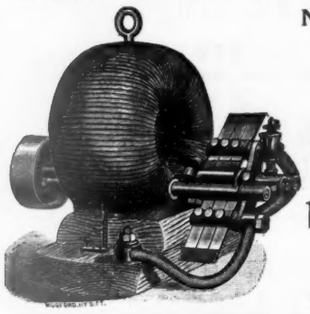

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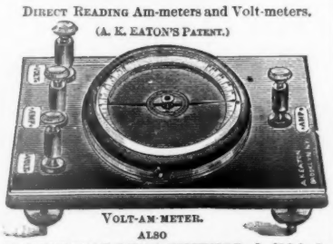

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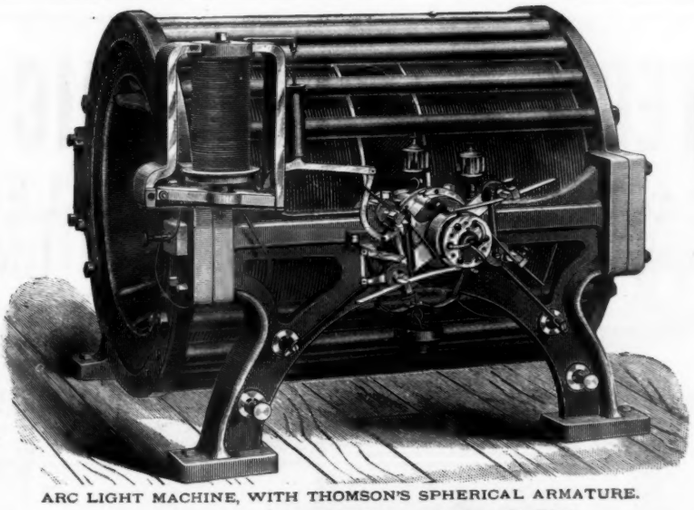

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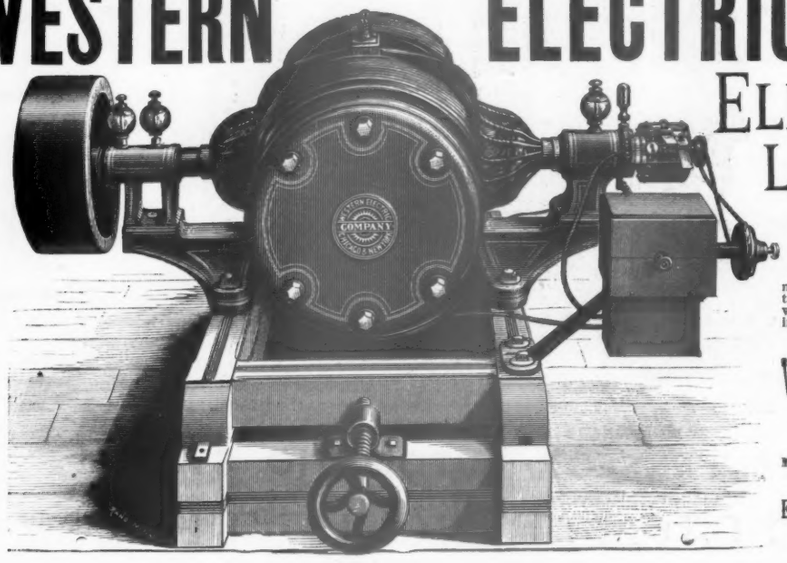

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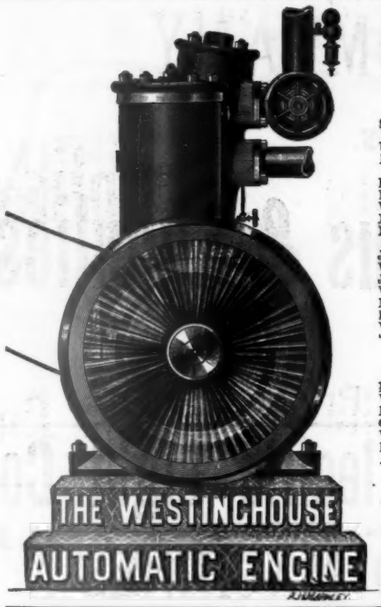

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Barnes Bros.,		Maquoketa Ia.	35
A. J. Mullen,		Selma, Ala.	35

		H. P.
Brainard & Shephard,	Albany, N. Y.	25
Henry Warden,	Philadelphia, Pa.	25
Crown Mills,	Marcellus, N. Y.	25
S. R. Cain,	Bristol, Vt.	25
Wabash, St. L. & Pacific R. R. 3d order,	Ft. Wayne, Ind.	25
Minneapolis Gas Light Co.,	Minneapolis, Minn.	25
" " 2d order,	" "	25
Thos. Henshall,	Paterson, N. J.	15
E. Balbach & Son, 15th order,	Newark, N. J.	15
Gas Engine and Power Co.,	New York,	15
Roulleaux, Dugage & Co., 2d order,	Suresnes, Fr.	15
Shickle, Harrison & Howard. 2d order,	St. Louis, Mo.	15
McCord, Ford & Co.,	Colfax, W. T.	15
Decatur Furnace Co.,	Decatur, Ala.	15
Lawrence Machine Shop, 15th order,	Lawrence, Mass.	10
" " 16th order,	" "	10
N. W. Walt, Son & Co.,	Sandy Hill, N. Y.	10
F. S. Cole,	Grundy City, Ia.	10
Union Pacific R. R , 2d order,	Omaha, Neb.	10
Geo. C. Howard,	Philadelphia, Pa.	5
Merritt W. Burwell,	New Haven, Ct.	5
Westinghouse Electric Co., 3d order,	Pittsburgh, Pa.	5
Lawrence Machine Shop, 17th order,	Lawrence, Mass.	5
" " 18th order,	" "	5
J. A. Diamond,	Indianoplis, Ind.	5
F. J. Yandle,	Santa Rosa, Cal.	5
Aberdeen Packing Co ,	Astoria, Or,	5
TOTAL, 56 ENGINES,		1975

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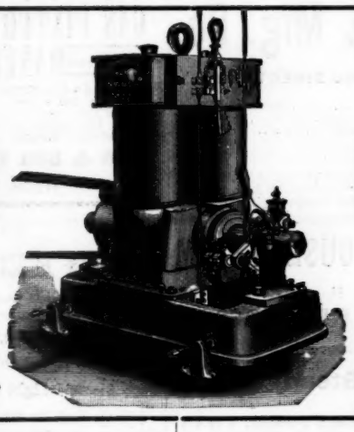

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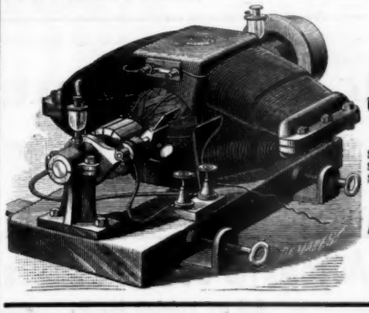

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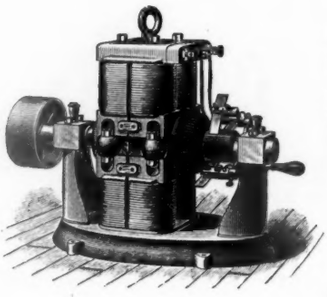

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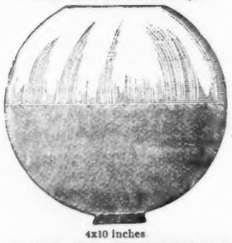

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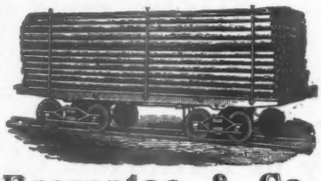

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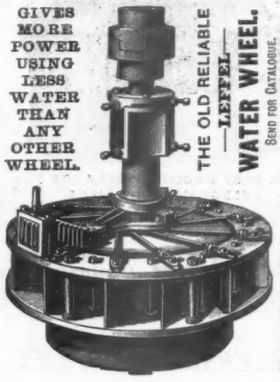

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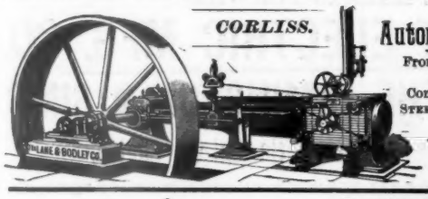

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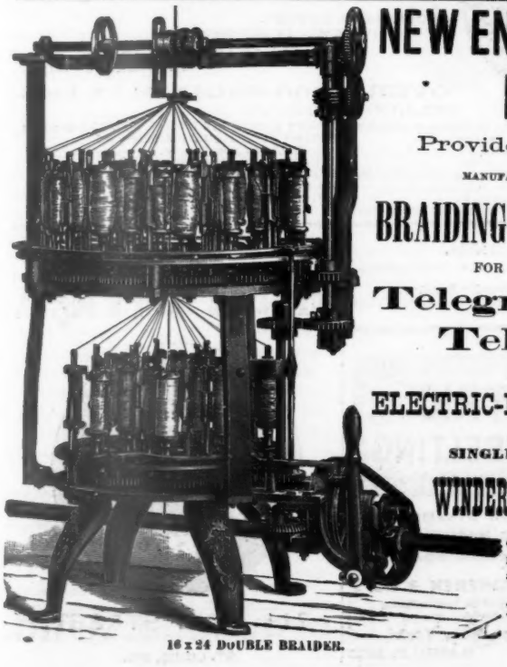

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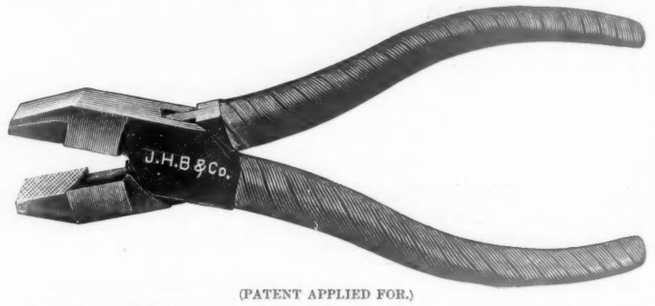

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